3.3.8 Wetland Group

Most of the information in Section 3.3.8 is reproduced or adapted from "Wisconsin's Biodiversity as a Management Issue" (Addis et al. 1995) and the WDNR Handbook "Ecological Landscapes of Wisconsin".

Wetland communities have a common characteristic - their soil, or other substrate, is periodically saturated with or covered by water. A wetland is defined in the *Wisconsin Statutes* as "an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions".

Wetlands form where the shape of the land is conducive to retaining water, including flat areas or depressions with limited outflow, where groundwater is present at the land surface, and in floodplains with water flow-through. Wetlands can sometimes form in unlikely places, such as on slopes, when the local climate produces continually wet conditions (Verry 1988). Landscape features and other variables that vary from site-to-site will influence both ecological function and plant and animal diversity.

Wetlands are part of the water cycle of all ecosystems, and their location in the landscape allows them to function as a buffer between upland areas and surface waters (Weller 1981). Wetlands perform a number of natural functions that benefit natural ecosystems and society. Water quality is often dependent upon wetlands because they serve to trap sediment, remove nutrients, protect shorelines, and slow the effects of flood water. They also serve as both discharge and recharge areas for groundwater and provide habitat for many species of plants and animals (Stearns 1978). In part due to these functions, wetlands exhibit higher biological productivity than most other community types, and support rare biota. Currently (2001), 43% of all federally-listed threatened and endangered species use wetlands at some point in their life cycles (Feierabend 1992). In Wisconsin, 32% of the state's listed species are wetland dependent. Further loss or degradation of wetlands would affect a disproportionate share of Wisconsin's rare species.

At present, Wisconsin has lost 47% of its original ten million acres of wetlands. Many of the remaining 5.3 million acres are in the northern third of the state (Wisconsin DNR 1990). In some southern Wisconsin counties, the amount of wetland loss is well over 75%. Wisconsin's losses are reflective of the national status of wetlands; it is estimated that one-half of the nation's original 221 million acres of wetlands have been lost (Feierabend 1992). A large amount of remaining acreage in Wisconsin exists in a partly altered state, such as with old drainage ditches still functional enough to change the hydrology of the wetland. Much of this remaining wetland acreage was at one time disturbed, either by drainage (followed by restoration) or by being cleared, repeatedly burned, grazed, or periodically plowed (Curtis 1959). Disturbance and other factors have opened many wetlands to invasion by non-native invasive species that can reduce the ecological value of wetlands.

During the development of the Wisconsin Strategy for Wildlife Species of Greatest Conservation Need, the Wetland Group included the following community types:

- Alder Thicket (Section 3.3.8.1, Page 3-735)
- Bog Relict (Section 3.3.8.2, Page 3-743)
- Boreal Rich Fen (Section 3.3.8.3, Page 3-749)
- Calcareous Fen (Southern) (Section 3.3.8.4, Page 3-753)
- Coastal Plain Marsh (Section 3.3.8.5, Page 3-759)
- Emergent Aquatic (Section 3.3.8.6, Page 3-764)
- Emergent Aquatic-Wild Rice (Section 3.3.8.7, Page 3-775)
- Ephemeral Ponds (Section 3.3.8.8, Page 3-782)
- Great Lakes Coastal Fen (Section 3.3.8.9, Page 3-790)
- Interdunal Wetland (Section 3.3.8.10, Page 3-797)

Summary of Vertebrate Species of Greatest Conservation Need Associated with Wetland Communities

58 Birds
12 Herptiles
8 Mammals

78 Total Species

- Northern Sedge Meadow (Section 3.3.8.11, Page 3-803)
- Open Bog (Section 3.3.8.12, Page 3-813)
- Shrub Carr (Section 3.3.8.13, Page 3-822)
- Southern Sedge Meadow (Section 3.3.8.14, Page 3-831)
- Submergent Aquatic (Section 3.3.8.15, Page 3-838)
- Submergent Aquatic – Oligotrophic Marsh (Section 3.3.8.16, Page 3-850)

The vertebrate Species of Greatest Conservation Need in each of these wetland communities are presented in the following sections along with information on opportunities, threats, and priority conservation actions. In addition, the natural communities included in the Aquatic Group are closely related to some of the natural communities present in the Wetland Group. Specifically, the submergent aquatic and emergent aquatic natural communities or their variants (i.e., emergent aquatic-wild rice and submergent aquatic-oligotrophic) could potentially be present in all of the aquatic communities. For that reason, the reader is encouraged to also review the community information in Section 3.3.1 (Aquatic Group) when working with the wetland communities listed above.

Similarly, several communities that often meet the "legal" and scientific definition of a wetland are included in other community groups within this document. Examples of those communities (along with their location in the document shown in parenthesis) include the following: wet prairie (Section 3.3.3.6), northern hardwood swamp (Section 3.3.5.4), northern wet forest (Section 3.3.5.6), floodplain forest (Section 3.3.7.2), southern hardwood swamp (Section 3.3.7.7), southern tamarack swamp (Section 3.3.7.9), and white pine-red maple swamp (Section 3.3.7.10).

3.3.8.1 Alder Thicket

3.3.8.1.1 Community Overview

The alder thicket is a minerotrophic wetland community dominated by tall shrubs, especially speckled alder. Shrub associates may include red-osier dogwood, nannyberry, cranberry viburnum, wild currants, and willows. Among the characteristic herbaceous species are Canada bluejoint grass, orange jewelweed, asters, boneset, rough bedstraw, marsh fern, arrow-leaved tearthumb, and sensitive fern. This community type is sometimes a seral stage between northern sedge meadow and northern conifer swamp or northern hardwood swamp, but occurrences can be stable and persist at given locations for long periods of time. This type is common and widespread in northern and central Wisconsin, but also occurs at isolated locales in the southern part of the state. Alder thicket often occurs as a relatively stable community along streams and around lakes, but can occupy large areas formerly covered by conifer swamps that were logged during the Cutover and/or where water tables were raised. Stands of alder that originated following logging and/or wildfire will usually revert to forest, although on heavy, poorly drained soils, forest re-growth can be problematic owing to "swamping" effects.

Groundwater seepage is an important attribute of alder thickets. Seepage areas are often indicated by the presence of skunk-cabbage, marsh-marigold, swamp saxifrage, American golden saxifrage, and marsh pennywort.

3.3.8.1.2 Vertebrate Species of Greatest Conservation Need Associated with Alder Thicket

Twenty-one vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with alder thicket (Table 3-170).

Table 3-170. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with alder thicket communities.

Species Significantly Associated with Alder Thicket
Birds
American Woodcock
Black-billed Cuckoo
Veery
Golden-winged Warbler
Herptiles
Four-toed Salamander
Wood Turtle
Eastern Massasauga Rattlesnake
Mammals
Gray Wolf
Moose
Species Moderately Associated with Alder Thicket
Birds
Canada Warbler
Rusty Blackbird
Herptiles
Pickerel Frog
Mink Frog
Blanding's Turtle
Queen Snake
Northern Ribbon Snake
Mammals
Water Shrew
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-170 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both alder thicket and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of alder thicket in each of the Ecological Landscapes (Tables 3-171 and 3-172).

- Using the analysis described above, a species was further selected if it had both a significant association with alder thicket and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of alder thicket. These species are shown in Figure 3-41.

Table 3-171. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with alder thicket communities and their association with Ecological Landscapes that support alder thicket.

Alder Thicket	Birds (4)*				Herptiles (3)			Mammals (2)	
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	American Woodcock	Black-billed Cuckoo	Veery	Golden-winged Warbler	Four-toed Salamander	Wood Turtle	Eastern Massasauga Rattlesnake	Gray Wolf	Moose
MAJOR									
Central Sand Plains	■	■	■	■	■	■	■	■	
North Central Forest	■	■	■	■	■	■		■	■
IMPORTANT									
Central Sand Hills	■	■	■	■	■			■	
Forest Transition	■	■	■	■	■	■		■	
Northeast Sands	■	■	■	■	■	■		■	
Northern Highland	■		■	■	■	■		■	■
Northwest Lowlands	■	■	■	■	■	■		■	■
Northwest Sands	■	■	■	■	■	■		■	
Superior Coastal Plain	■	■	■	■	■	■		■	■
Western Coulee and Ridges	■	■	■		■	■	■		
PRESENT (MINOR)									
Central Lake Michigan Coastal	■	■	■	■	■	■			
Northern Lake Michigan Coastal	■	■	■	■	■	■		■	
Southeast Glacial Plains	■	■	■	■	■		■		
Western Prairie	■		■			■			

Color Key

■ = **HIGH probability the species occurs in this Ecological Landscape**

■ = **MODERATE probability the species occurs in this Ecological Landscape**

□ = **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-172. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with alder thicket communities and their association with Ecological Landscapes that support alder thicket.

Alder Thicket	Birds (2)*		Herptiles (5)					Mammals (5)				
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Canada Warbler	Rusty Blackbird	Pickerel Frog	Mink Frog	Blanding's Turtle	Queen Snake	Northern Ribbon Snake	Water Shrew	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
MAJOR												
Central Sand Plains	M	M	M		H			M	M	M	M	M
North Central Forest	H	M	M	H				H	M	H	M	H
IMPORTANT												
Central Sand Hills		M	M		H			M	M	M	M	M
Forest Transition	M	M	M					M	M	M	H	M
Northeast Sands	M	M	M	H	M			H				
Northern Highland	H	M		H				H			M	
Northwest Lowlands	H	M	M	H				H	M	M	M	M
Northwest Sands	M	M	M	M	H			H				
Superior Coastal Plain	H	M	M	H				H	M	M	M	M
Western Coulee and Ridges		H	H		H				H	M	M	M
PRESENT (MINOR)												
Central Lake Michigan Coastal	M	M	M		M		H		M	M	M	M
Northern Lake Michigan Coastal	H	M	M	H	M			H	M	M	M	M
Southeast Glacial Plains		H	H		H	H	H		M	M	M	M
Western Prairie		M	M		H							

Color Key

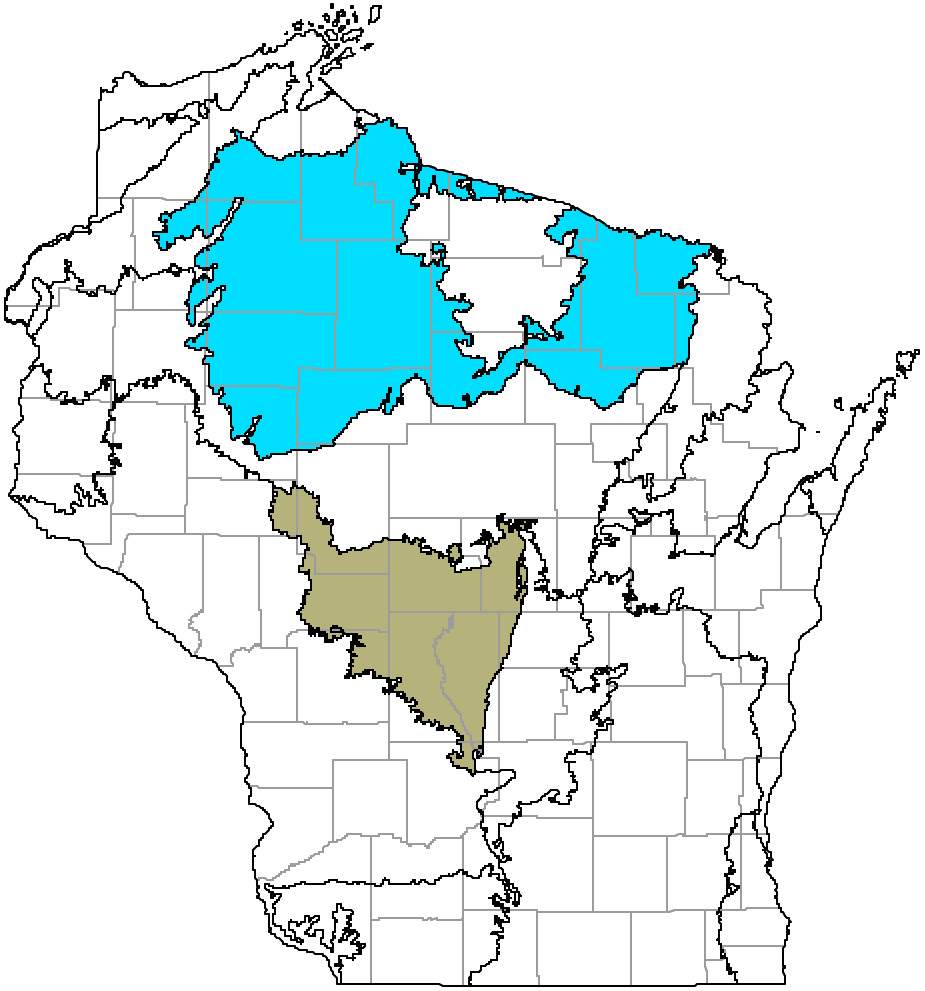
H = **HIGH probability the species occurs in this Ecological Landscape**

M = **MODERATE probability the species occurs in this Ecological Landscape**

= **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-41. Vertebrate Species of Greatest Conservation Need that have *both* a significant association with alder thicket *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of alder thicket.



Central Sand Plains
American Woodcock
Black-billed Cuckoo
Veery
Golden-winged Warbler
Wood Turtle
Gray Wolf

North Central Forest
American Woodcock
Black-billed Cuckoo
Veery
Golden-winged Warbler
Four-toed Salamander
Wood Turtle
Gray Wolf

3.3.8.1.3 Threats and Priority Conservation Actions for Alder Thicket

3.3.8.1.3.1 Statewide Overview of Threats and Priority Conservation Actions for Alder Thicket

The following list of threats and priority conservation actions were identified for alder thicket in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.1.3.2 unless otherwise indicated.

Threats and Issues

- Changes in hydrology from road construction, development, and agricultural drainage, or flooding by beaver activity can be detrimental to this community.
- Lowering the water tables of sedge meadows or poor fens can lead to an increase in shrubs, including alder.
- Raising water tables in lowland forests can increase the abundance of alder.
- Conversion and succession to other types (e.g., northern hardwoods or northern conifer swamp) is limited but occurring.
- Residential lakeshore/river-side development can result in the removal of alder and other "rank" vegetation, which may be considered unsightly by some.
- Reed canary grass can invade and take over this community, especially in landscapes where grazing is common such as the Forest Transition, Western Ridges and Coulees, and in parts of the Superior Coastal Plain.
- More information is needed to understand how to manage and maintain this type, and avoid the negative impacts mentioned above.

Priority Conservation Actions

- Protect significant areas from hydrological changes from road construction, development, and agricultural drainage. Maintain beaver populations at acceptable levels.
- Preserve large blocks of habitat and embed the habitat in a matrix of other native community types.
- Opportunities exist in some of the northern landscapes to manage for early successional forest birds by providing early successional forest habitat adjacent to alder thickets.
- Given both local and landscape level considerations, it may also be appropriate and desirable to embed alder thicket within complexes that contain significant patches of older forest.
- Support research to better understand how to manage this community type. There appear to be differences in community function between alder that occurs in stable landscape positions (e.g., along streams) versus alder that is a shorter-term occurrence related to flooding by beaver or other hydrologic changes. Depending on landscape position, alder may be self-maintaining. Techniques used to maintain alder need further investigation.
- Manage lands to limit establishment of invasive plants.
- Continue and support biological control research to manage invasives.

3.3.8.1.3.2 Additional Considerations for Alder Thicket by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of alder thicket exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for alder thicket found in Section 3.3.8.1.3.1.

Additional Considerations for Alder Thicket in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management of Alder Thicket

Central Sand Plains

This community type is common and widespread here and should be managed and protected as an integral part of the many wetland complexes. Good examples include Clear Creek at Fort McCoy Military Reservation (Monroe County), Robinson Creek, (Jackson County), Hulbert Creek (Sauk County), Necedah National Wildlife Refuge (Juneau County), and Little Roche a Cri Creek (Adams County).

North Central Forest

This Ecological Landscape is a good place to maintain the alder thicket community because of its abundance and large amount of land under public ownership. Examples occur on federal, state, and county forests in this Ecological Landscape, such as Dailey's Marsh, Hunting River Alders, and Wildcat Springs (Langlade County); Sidney Creek Swamp (Marinette County); and Ruby Swamp (Chippewa County). Altered hydrology is an issue in some parts of this Ecological Landscape, especially from road construction and residential development. Invasives are not a large problem at present, but should be monitored.

Additional Considerations for Alder Thicket in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management of Alder Thicket

Central Sand Hills

Stream corridors and areas around spring seeps have potential for occurrences of alder thicket. Examples are found at Caves Creek Headwaters, Chaffee Creek State Fishery Area, Mecan River State Fishery Area, and Lawrence Creek State Natural Area (all in Marquette County). More extensive wetland inventories are needed in this landscape.

Forest Transition

The best-documented opportunities in this Ecological Landscape occur in the eastern and northern parts of the Ecological Landscape, but the community is widespread here. Examples are at Pope Lake and Myklebust Lake (Waupaca County), along the Red River (Shawano County), Tenmile Creek Marsh (Rusk County), and Little Black River Sedge Meadow (Taylor County). More extensive inventories are needed. Grazing occurs in this Ecological Landscape and can degrade the habitat and lead to invasion by non-native plants. Past conversion of forests and wetlands to agricultural fields and pastures limits opportunities for management and protection.

Northeast Sands

Examples occur on the Peshtigo River State Forest, and at Best Thicket, Chemical Creek Cedar Swamp, and New Athelstane Barrens (all in Marinette County).

Northern Highland

Many good examples of alder thicket occur on the Northern Highland-American Legion State Forest. Others are found at the Willow Flowage, Rice Lake–Thunder Lake Marsh, Holmboe Conifer Forest, Trout Creek, Tomahawk River Pines, and Bootjack Bog (all in Oneida County), Siphon Creek, Goodyear Springs and Salsich Springs (in Vilas County).

Northwest Lowlands

Although alder thicket is not widely distributed in this Ecological Landscape, there are good opportunities for protection (e.g., Ekdall Wetlands in Burnett County). Other examples may be found at Empire Swamp, Black Lake Bog, and along Ericson Creek (all in Douglas County). This Ecological Landscape has a lower population density and lower road density, thus fewer negative impacts from fragmentation and altered hydrology occur here. This community type is common on county forestland. It often occurs in the stream valleys between forested ridges and on the margins of large peatlands, which are common in this Ecological Landscape. Alder thickets should be managed as a complex with streams, lakes, sedge meadows, and a variety of peatland communities. Beaver impacts should be evaluated and beaver populations should be maintained at an appropriate level. There are some potential impacts from invasive plant species such as buckthorns and Asian honeysuckles, thus early detection and control are important.

Northwest Sands

Extensive corridors of alder thicket along streams and lakeshores should be maintained. An exceptional example occurs along the Upper Brule River. Other occurrences include many locations along the Upper St. Croix River, Osgood Spring Pond (Sawyer County), and Heffelfinger Spring Pond (Douglas County).

Superior Coastal Plain

Alder thicket should be maintained as a complex with streams, lakes, sedge meadows, and a variety of peatland communities. Significant occurrences include the Bibon Swamp (Ashland County), Superior Municipal Forest (Douglas County), Bark Bay Slough State Natural Area (Bayfield County), and the northern part of the Brule River State Forest (Douglas County). Reed canary grass is a problem in the western portion of the Ecological Landscape and around the City of Ashland.

Western Coulee and Ridges

Entire river corridors should be protected and sustained from lowlands well into uplands. Buffers within floodplains should be used to prevent compaction, trampling, and sedimentation. Grazing is a common practice in the wetlands of this Ecological Landscape, and can degrade the habitat and lead to invasion by non-native plants such as reed canary grass. Good examples occur at Silver Creek on Fort McCoy Military Reservation (Monroe County), Dell Creek State Wildlife Area (Sauk County), and along tributaries of the Kickapoo River (e.g., on the Kickapoo Reserve, Vernon County).

3.3.8.2 Bog Relict

3.3.8.2.1 Community Overview

'Bog relict' is a term that has been used to describe tamarack-dominated forests and associated patches of "northern" shrubs, mosses, and other acid peatland herbs in the southernmost regions of Wisconsin, including some that are close to the Illinois border. Many of these sites are nearing the extreme southern range limits for many of the species they support and are also quite isolated from one another. They support many nutrient-demanding species, but may include a limited subset of the more northern peatland associates (e.g., *Sphagnum* mosses, ericaceous shrubs, and "bog" sedges). The tamarack canopy is often quite open and discontinuous, due to windthrow, beaver activity, or for other reasons. Poison sumac is often present, and is sometimes the most abundant tall shrub. Speckled alder, nannyberry, willows, and dogwoods are often common associates. See s*outhern tamarack swamp* for additional details on plant composition.

These sites are typically small, in kettle depressions on outwash or sometimes ground moraine landforms. Many of these stands are fed by groundwater seepage. The surface may include areas of relatively firm peat, but watery muck is often present as well.

Conceptually, *bog relict* is broader and more encompassing than s*outhern tamarack swamp*, as it includes the full mosaic of northern peatland vegetation (forest, shrub, and herb) occurring within a given kettle wetland. In addition, the term has generally been applied to small discrete and disjunct sites, located far to the south of the typical range of the acid peatland communities.

3.3.8.2.2 Vertebrate Species of Greatest Conservation Need Associated with Bog Relict

Eleven vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with bog relict (Table 3-173).

Table 3-173. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with bog relict communities.

Species Significantly Associated with Bog Relict
Herptiles
Four-toed Salamander
Northern Ribbon Snake
Species Moderately Associated with Bog Relict
Birds
American Woodcock
Whip-poor-will
Willow Flycatcher
Blue-winged Warbler
Rusty Blackbird
Mammals
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-173 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both bog relict and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of bog relict in each of the Ecological Landscapes (Tables 3-174 and 3-175).

- Using the analysis described above, a species was further selected if it had both a significant association with bog relict and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of bog relict. These species are shown in Figure 3-42.

Table 3-174. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with bog relict communities and their association with Ecological Landscapes that support bog relict.

Bog Relict

Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Herptiles (2)*	
	Four-toed Salamander	Northern Ribbon Snake
MAJOR		
Southeast Glacial Plains		
IMPORTANT		
Central Sand Hills		
Southern Lake Michigan Coastal		
PRESENT (MINOR)		
Central Lake Michigan Coastal		
Western Coulee and Ridges		

Color Key

= **HIGH probability the species occurs in this Ecological Landscape**

= **MODERATE probability the species occurs in this Ecological Landscape**

= **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-175. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with bog relict communities and their association with Ecological Landscapes that support bog relict.

Bog Relict	Birds (5)*					Mammals (4)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	American Woodcock	Whip-poor-will	Willow Flycatcher	Blue-winged Warbler	Rusty Blackbird	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
MAJOR									
Southeast Glacial Plains									
IMPORTANT									
Central Sand Hills									
Southern Lake Michigan Coastal									
PRESENT (MINOR)									
Central Lake Michigan Coastal									
Western Coulee and Ridges									

Color Key

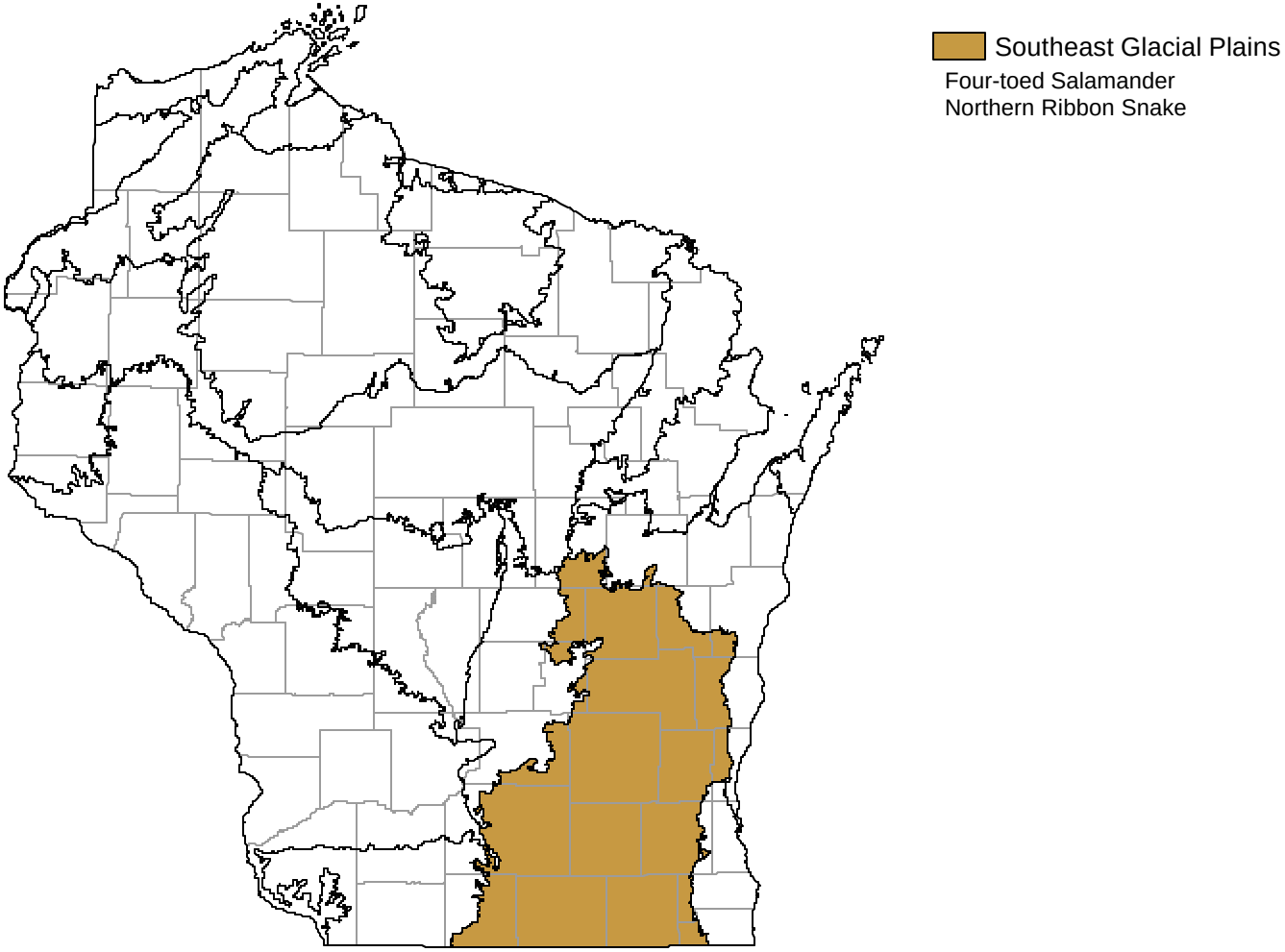
= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-42. Vertebrate Species of Greatest Conservation Need that have *both* a significant association with bog relict *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of bog relict.



3.3.8.2.3 Threats and Priority Conservation Actions for Bog Relict

3.3.8.2.3.1 Statewide Overview of Threats and Priority Conservation Actions for Bog Relict

The following list of threats and priority conservation actions were identified for bog relict in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.2.3.2 unless otherwise indicated.

Threats and Issues

- Road construction, agriculture, and development can alter hydrology to the detriment of this community type. Associated impacts from sedimentation, high nutrient loads, pollutants, and pesticides can also affect the community.
- When hydrologic changes and other impacts occur, this community may convert to shrub swamp or hardwood swamp.
- Unsustainable forest management and agricultural practices can result in soil compaction, soil erosion, water quality issues, invasive species establishment, and regeneration problems.
- More information is needed to understand how to manage this type and assess the impacts of management activities.
- Fragmentation and isolation are issues for some sites.
- Invasive plants are a major problem in some Ecological Landscapes, and should be monitored and controlled, especially glossy buckthorn.
- Tamarack is often declining, and failing to regenerate at some sites in southern regions.
- Many bog relicts in the southern Ecological Landscapes were formerly grazed, and attempts were often made to at least partially drain them to create muck farms or pasture.

Priority Conservation Actions

- This type requires more survey work to identify intact, high quality sites, and better document those occurrences and determine the status of associated rare species. Basic vegetation studies are still needed for conifer swamps throughout Wisconsin, to better document composition and structure, to determine the status and distributions of rare species, assess negative impacts due to hydrologic alterations and colonization by invasive plants, and to develop a classification that better reflects natural variability.
- There is a need for continued monitoring and additional research to understand the composition, disturbance regimes and dynamics needed to sustain this system.
- Southern tamarack stands should be studied to determine reasons for decline.
- Land use planning that includes consideration of conservation needs could be implemented to limit hydrologic changes that negatively affect bog relicts.
- This community type should be managed as part of a complex with other forest and wetland types where possible, or with savanna and grassland communities where appropriate. Isolated sites should be embedded in other forest habitats, or buffered from land uses that can degrade the "relict" vegetation.
- Restore altered hydrology where possible.
- Opportunities to manage for boreal birds, *Lepidoptera*, and other taxa are important and can enhance diversity at local and regional scales; additional survey work should clarify the status of some of these species and enable conservationists to better prioritize protection and management projects. WDNR's 'Peatlands Project' is expected to yield significant new information on this type (along with other peatland communities).
- Best Management Practices and other sustainable forest management practices should be used to limit soil damage, erosion, sedimentation, and hydrologic changes.
- Continue to support research to find biocontrols for invasives. Prevent the spread of new invasives into the community type.

3.3.8.2.3.2 Additional Considerations for Bog Relict by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of bog relict exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for bog relict found in Section 3.3.8.2.3.1.

Additional Considerations for Bog Relict in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management of Bog Relict

Southeast Glacial Plains

Invasive non-native plants are a problem in southern tamarack stands (e.g., glossy buckthorn). Poison sumac can be abundant in this community, making work in this type difficult. Many tamarack stands are not regenerating and the larger trees are experiencing dieback. Fragmentation and stand isolation are significant issues in this EL.

The large forested peatlands in Jefferson County, in the Mukwonago River watershed, and at a few other locations are now classified as s*outhern tamarack swamp*. Past drainage to create muck farms and pasture eliminated much of the swamp conifer community here. Rare species include northern plants and animals at their southern range limits, but also some that are most often associated with southern "fen" habitats. Fire may have played an important role in maintaining this type historically. Some stands appear to be succeeding to hardwoods such as red maple. Restoration techniques need to be developed for this "type" (using the term broadly) in the southern part of its range. At some locations (e.g., Mukwonago River) it would be appropriate to manage bog relict with southern tamarack swamp, calcareous fen, southern sedge meadow, shrub-carr, oak opening, or oak woodland/southern dry forest.

Additional Considerations for Bog Relict in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management of Bog Relict

Central Sand Hills

Changes in hydrology due to development can be detrimental to this community type. There are continuing effects from past hydrologic changes (e.g., ditching, dike construction, road building, etc.). Some agricultural practices can result in soil erosion and water quality problems (e.g., sedimentation and high nutrient loads). Invasives are serious problems in some southern tamarack stands. Fragmentation and stand isolation affect this type in central and southern Wisconsin.

Southern Lake Michigan Coastal

Invasives are a significant problem in southern peatlands. The "northern" understory is represented by a very reduced subset of plants in this Ecological Landscape. Often, conifers are not regenerating. Stand isolation and fragmentation are major issues. High deer densities, fire suppression, and succession may all be affecting species composition and stand structure.

This type is extremely limited in acreage in this Ecological Landscape and should be embedded in other forest habitats where possible, or buffered from potentially deleterious land uses. More survey work is needed to assess the current condition of known stands. Restoration techniques should be developed for this type in southern Wisconsin.

3.3.8.3 Boreal Rich Fen

3.3.8.3.1 Community Overview

Boreal rich fen is a rare open peatland community of northern Wisconsin that is associated with glacial moraines, or less commonly, outwash landforms, in which the underlying substrate includes calcareous materials. Like many other "northern" peatlands, nutrient levels are low, but pH is significantly higher than in the poor fen and open bog communities and influences the plant composition. Sphagnum mosses are of lesser importance in this type than are the so-called "brown" mosses (e.g., from the genera *Campyllium, Drepanocladus,* or *Scorpidium*). Characteristic vascular plants may include woolly sedge, twig-rush, white beak-rush, beaked bladderwort, rushes, Hudson Bay cotton-grass, rush aster, and buckbean.

The "richest" northern fens occur on the Door Peninsula, which is underlain by calcareous bedrock and mantled with calcareous till. Here, in addition to the species mentioned above, the open peatlands may support species such as coast sedge, linear-leaved sundew, brook lobelia, grass-of-Parnassus, shrubby cinquefoil, hair beak-rush, and tufted bulrush. The proximity of carbonate-enriched bedrock is almost certainly among the factors responsible for the composition of the northern fens in this region.

Shrub phases of the boreal rich fen community also occur, in which shrubby cinquefoil, bog birch, sage willow, and speckled alder may be present in significant amounts, and collectively form the dominant plant cover.

3.3.8.3.2 Vertebrate Species of Greatest Conservation Need Associated with Boreal Rich Fen

Seven vertebrate Species of Greatest Conservation Need were identified as moderately associated with boreal rich fen (Table 3-176). There were not any vertebrate Species of Greatest Conservation Need that were identified as significantly associated with boreal rich fen communities.

Table 3-176. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately associated with boreal rich fen communities.

Birds
Connecticut Warbler
Canada Warbler
Herptiles
Mink Frog
Mammals
Northern Long-Eared Bat
Silver-Haired Bat
Eastern Red Bat
Hoary Bat

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-176 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both Boreal rich fen and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of Boreal rich fen in each of the Ecological Landscapes (Table 3-177).

Table 3-177. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with boreal rich fen communities and their association with Ecological Landscapes that support boreal rich fens.

Boreal Rich Fen	Birds (2)*		Herptiles (1)	Mammals (4)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Connecticut Warbler	Canada Warbler	Mink Frog	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
MAJOR							
Northern Lake Michigan Coastal							
IMPORTANT							
North Central Forest							
Northeast Sands							
Northern Highland							

Color Key

= **HIGH probability the species occurs in this Ecological Landscape**

= **MODERATE probability the species occurs in this Ecological Landscape**

= **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

3.3.8.3.3 Threats and Priority Conservation Actions for Boreal Rich Fen

3.3.8.3.3.1 Statewide Overview of Threats and Priority Conservation Actions for Boreal Rich Fen

The following list of threats and priority conservation actions were identified for boreal rich fen in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.3.3.2 unless otherwise indicated.

Threats and Issues

- Disruption of hydrology due to ditching, dredging, dike or road construction, and excessive withdrawal of groundwater are among the disturbances that can adversely affect site hydrology.
- The colonization by and spread of invasive plants, especially glossy buckthorn, is a serious problem in northeastern Wisconsin.
- The addition of excess nutrients to this habitat can alter conditions and reduce the ability of the community to support sensitive plants that have relatively narrow habitat tolerances. If streams, overland flow, or polluted groundwater allow nutrient levels to rise appreciably, there may be a trend toward developing more marsh-like characteristics. Robust graminoid species like cat-tails or the invasive giant reed become dominant, and there is corresponding reduction in the diversity and abundance of the more sensitive native species.

Priority Conservation Actions

- Protect or restore site hydrology.
- Protect water quality from pollutants and excess sediments.
- Control invasive plants. Support research to identify and develop effective and practical means of controlling invasive plants.
- Work with public lands managers and private conservation organizations to implement appropriate management and protection measures.
- Conduct additional inventory work in selected regions of Wisconsin to identify and better document occurrences of this community type.
- Manage as part of a vegetation mosaic that includes other open wetland communities, shrub swamp, and swamp conifer forest.
- Promote the establishment of effective buffer areas on adjoining uplands.
- Additional inventory work is needed to better document the distribution, status, composition and structure of this community type in Wisconsin.

3.3.8.3.3.2 Additional Considerations for Boreal Rich Fen by Ecological Landscape

Special considerations have been identified for Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of boreal rich fen exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for boreal rich fen found in Section 3.3.8.3.3.1.

Additional Considerations for Boreal Rich Fen in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

Northern Lake Michigan Coastal

All occurrences identified to date are on the Door Peninsula. Groundwater pollution is a significant threat in this Ecological Landscape, because of the nearness to the surface of the fractured, soluble bedrock.

Additional Considerations for Boreal Rich Fen in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

North Central Forest

Several rich fens have been described from the northernmost portions of this Ecological Landscape. Additional survey work is needed here, especially on public lands.

Northeast Sands

Several small stands of this type have been documented on public lands in the Northeast Sands. "Rich" conifer forests (white cedar swamps) are very common in this Ecological Landscape, and additional survey work has a good chance of turning up new occurrences of "rich" open peatlands as well.

Northern Highland

"Rich fens" are seemingly an anomaly in this region of deep, acid outwash sands, but there are several good examples known from the Northern Highland-American Legion State Forest.

3.3.8.4 Calcareous Fen (Southern)

3.3.8.4.1 Community Overview

Calcareous fens occur mostly in southern Wisconsin, on sites that are fed by carbonate-enriched groundwater. Most fens are small, covering no more than a few acres, and are often associated and can intergrade with more abundant and widespread wetland communities such as southern sedge meadow, wet prairie, shrub-carr, emergent marsh, and southern tamarack swamp. An accumulation of peat can raise the fen surface to a height of several meters above the adjoining lands.

The diverse fen flora is distinctive, containing many calciphiles of restricted distribution. Common or representative plants include sedges, marsh fern, shrubby cinquefoil, shrubby St. John's-wort, Ohio goldenrod, grass-of-parnassus, twig-rush, brook lobelia, boneset, swamp thistle, and asters. Many fens have a significant number of prairie or sedge meadow components, and some contain plants often associated with bogs, such as tamarack, bog birch and pitcher plant.

Fens occur in several landscape settings, including the bases of morainal slopes, on sloping deposits of glacial outwash, in the headwaters regions of spring runs and small streams, and on the shores of alkaline drainage lakes.

3.3.8.4.2 Vertebrate Species of Greatest Conservation Need Associated with Calcareous Fen (Southern)

Ten vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with calcareous fen (southern) (Table 3-178).

Table 3-178. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with calcareous fen (southern) communities.

Species Significantly Associated with Calcareous Fen (Southern)
Herptiles
Butler's Garter Snake
Eastern Massasauga Rattlesnake
Species Moderately Associated with Calcareous Fen (Southern)
Birds
American Woodcock
Willow Flycatcher
Rusty Blackbird
Herptiles
Pickerel Frog
Mammals
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-178 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both

calcareous fen (southern) and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of calcareous fen (southern) in each of the Ecological Landscapes (Tables 3-179 and 3-180).

- Using the analysis described above, a species was further selected if it had both a significant association with calcareous fen (southern) and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of calcareous fen (southern). These species are shown in Figure 3-43.

Table 3-179. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with calcareous fen (southern) communities and their association with Ecological Landscapes that support calcareous fen (southern).

Calcareous Fen (Southern)	Herptiles (2)*	
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Butler's Garter Snake	Eastern Massasauga Rattlesnake
MAJOR		
Central Sand Hills		
Southeast Glacial Plains		
IMPORTANT		
Southern Lake Michigan Coastal		
PRESENT (MINOR)		
Central Sand Plains		
Western Coulee and Ridges		

Color Key

= **HIGH probability the species occurs in this Ecological Landscape**

= **MODERATE probability the species occurs in this Ecological Landscape**

= **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-180. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with calcareous fen (southern) communities and their association with Ecological Landscapes that support calcareous fen (southern).

Calcareous Fen (Southern)	Birds (3)*			Herptiles (1)	Mammals (4)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	American Woodcock	Willow Flycatcher	Rusty Blackbird	Pickerel Frog	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
MAJOR								
Central Sand Hills	H	H	M	M	M	M	M	M
Southeast Glacial Plains	H	H	H	H	M	M	M	M
IMPORTANT								
Southern Lake Michigan Coastal	M	H	M					
PRESENT (MINOR)								
Central Sand Plains	H	H	M	M	M	M	M	M
Western Coulee and Ridges	H	H	H	H	H	M	M	M

Color Key

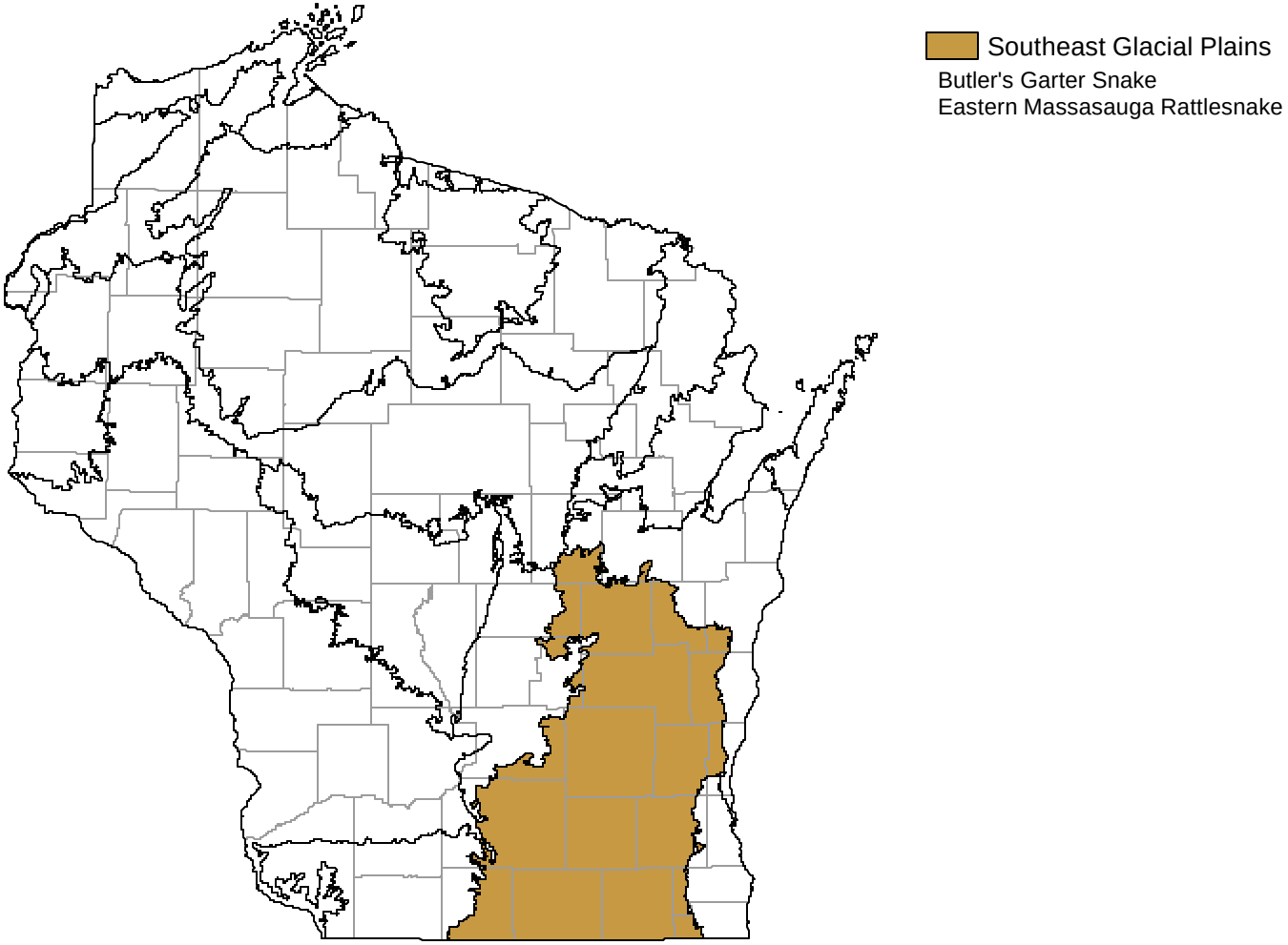
H = HIGH probability the species occurs in this Ecological Landscape

M = MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-43. Vertebrate Species of Greatest Conservation Need that have *both* a significant association with calcareous fen (southern) *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of calcareous fen (southern).



3.3.8.4.3 Threats and Priority Conservation Actions for Calcareous Fen (Southern)

3.3.8.4.3.1 Statewide Overview of Threats and Priority Conservation Actions for Calcareous Fen (Southern)

The following list of threats and priority conservation actions were identified for calcareous fen (southern) in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.4.3.2 unless otherwise indicated.

Threats and Issues

- The primary threat to calcareous fens is disruption of hydrology.
- Ditching, diking, dredging, tiling, pumping, and quarrying can all affect the quantity and quality of groundwater needed by fens to persist.
- Water quality may be affected by septic system leakage, infiltration of dissolved road salt, agricultural runoff, and contaminant plumes in groundwater.
- Residential development that is accompanied by the withdrawal of waters from local aquifers can reduce the amount of water available to maintain the fens.
- Invasive species can be serious threats to calcareous fens, with glossy buckthorn, narrow-leaved cattail, giant reed, and purple loosestrife among the potential offenders.
- Grazing, vehicular traffic, and overuse by hikers or other recreationists can physically damage the surface and destroy sensitive vegetation.
- Historically, fire played a key role in maintaining many of the fens in southern Wisconsin. The lack of fire in the present landscape has contributed to the encroachment of woody species on open fen habitat, with the consequent suppression or loss of some of the more light-demanding herbs.
- When considering the introduction of prescribed fire into fen habitat, it should be noted that the fen community can support rare animals, such as the swamp metalmark butterfly, an invertebrate Species of Greatest Conservation Need, that are sensitive to fire in all stages of their life cycles. Burn plans need to be designed with the needs of such species in mind.

Priority Conservation Actions

- Preservation of hydrologic function sometimes requires the management of surrounding lands, as well as groundwater resources.
- Develop partnerships with private conservation organizations, agricultural interests, municipalities, and other government agencies to manage and protect surrounding lands.
- Protection should be encouraged, especially on privately owned sites, by providing landowner incentives.
- Where possible, manage in complexes of marsh, wet meadow, low prairie, shrub-carr, and tamarack swamp.
- Continue to work on the protection of important fens through the variety of means available.
- Develop effective biocontrols for pernicious invasive plants such as glossy buckthorn.
- Continue research on the development of management techniques that maintain the community and protect its most sensitive elements.

3.3.8.4.3.2 Additional Considerations for Calcareous Fen (Southern) by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of calcareous fen (southern) exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for calcareous fen (southern) found in Section 3.3.8.4.3.1.

Additional Considerations for Calcareous Fen (Southern) in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

Central Sand Hills

The wetlands bordering some of the spring-fed streams in this Ecological Landscape include a number of important fens, some of them on private lands.

Southeast Glacial Plains

Several exceptional calcareous fens have been identified in and around the kettle interlobate moraine, toward the southeastern edge of the Ecological Landscape. The most notable area is the South Unit of the Kettle Moraine State Forest. The upper reaches of the Mukwonago River also harbor a concentration of fens.

Additional Considerations for Calcareous Fen (Southern) in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

Southern Lake Michigan Coastal

In this Ecological Landscape there are some unusual and highly distinctive variants of this community. Wisconsin's sole example of Lakeplain prairie contains fen-like areas within the complex mosaic of natural communities now protected at Chiwaukee Prairie State Natural Area (Kenosha County). Clay bluffs bordering Lake Michigan in southern Milwaukee County have highly localized patches from which groundwater is discharged. The vegetation in these seepage areas strongly resembles that of the fens, with a number of calciphilic plants present.

3.3.8.5 Coastal Plain Marsh

3.3.8.5.1 Community Overview

The distribution of this community is limited to a few sites within the sandy beds or margins of extinct glacial lakes, on level or gently sloping glacial outwash sands, and, possibly, in glacial tunnel channels. Layers of fine-textured, relatively impermeable materials occur at shallow depths beneath the surface of at least some of these waterbodies and wetlands, and they're probably essential to normal hydrologic function. The lake or pond waters are nutrient-poor and acidic, and all known occurrences of the community are small, or at most, medium-sized. Historically the surrounding vegetation included oak and pine barrens; dry acid forests composed of oaks, pines, or mixtures; sand prairie; and various peatland communities. Periodic wildfire would have been the major disturbance force in all of these communities prior to European settlement and the implementation of fire suppression policies.

The coastal plain marsh develops on sandy lake or pond shores, sometimes with the sandy waterbody margins partially covered by localized, discontinuous layers of shallow peat or muck. At a number of sites in central Wisconsin, members of the coastal plain marsh community - including some of the rare disjuncts - have colonized, at least temporarily, ditches, borrow pits, log landings, and haul roads. At all of these sites, the ranker, overlying vegetation has been stripped away, exposing wet sand that may be fed by slow groundwater seepage from the surrounding uplands. Sometimes in these sites there are shallow excavations, creating small ponds. The long-term conservation values of such sites are uncertain, as is the source of propagules for the flora that colonizes them. In the natural systems, many, if not most of the propagules come from the local seedbank. In those sites that are of anthropogenic origin, the source is unclear, but it seems likely that, for some species, dispersal may be aided by animals (especially, but perhaps not limited to, migratory birds), and by water moving through the ditches.

The vegetation often demonstrates strong zonation, with water depth the determinant factor. The deeper, more permanent waters support aquatic macrophytes such as watershield, pondweeds, and bladderworts. The inshore shallows and pond margins are often dominated by diverse assemblages of short or medium stature graminoid plants including grasses, sedges (e.g., from the genera *Cyperus*, *Eleocharis*, *Fimbristylis*, *Fuirena*, *Rhynchospora*, *Scleria*, and *Scirpus*), and rushes (*Juncus spp.*), as well as forbs like milkworts, toothcup, meadow-beauty, lance-leaved violet, yellow-eyed grass, and several of the small St. John's worts. The uppermost, seldom-inundated margins of the wetland are typically vegetated with more robust perennials, such as grass-leaved goldenrod, Canada bluejoint grass, hardhack, meadowsweet, boneset, Joe-Pye weed, and asters.

Coastal plain marsh was not recognized as a distinct community by Curtis (1959), though he did acknowledge the presence of a coastal plain flora in the state. The unusual distributions of the coastal plain plants have long been recognized by Wisconsin botanists, however. Most of the information on this type comes from farther east; Michigan, Indiana, Ontario, and New York. In Michigan and Indiana, the distribution of this community is strongly correlated with post-glacial levels of Lake Michigan. Wisconsin occurrences support fewer of the rarities and extreme disjuncts than stands in Michigan and points eastward, but the same general patterns of geographic origin and distribution, and many habitat similarities, are in evidence.

3.3.8.5.2 Vertebrate Species of Greatest Conservation Need Associated with Coastal Plain Marsh

Six vertebrate Species of Greatest Conservation Need were identified as moderately associated with coastal plain marsh (Table 3-181). There were not any vertebrate Species of Greatest Conservation Need that were identified as significantly associated with coastal plain marsh communities.

Table 3-181. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately associated with coastal plain marsh communities.

Birds
Solitary Sandpiper
Herptiles
Blanding's Turtle
Mammals
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-181 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both Coastal plain marsh and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of coastal plain marsh in each of the Ecological Landscapes (Table 3-182).

Table 3-182. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with coastal plain marsh communities and their association with Ecological Landscapes that support coastal plain marsh.

Coastal Plain Marsh	Birds (1)*	Herptiles (1)	Mammals (4)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Solitary Sandpiper	Blanding's Turtle	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
MAJOR						
Central Sand Hills						
IMPORTANT						
Central Sand Plains						

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Color Key

= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

3.3.8.5.3 Threats and Priority Conservation Actions for Coastal Plain Marsh

3.3.8.5.3.1 Statewide Overview of Threats and Priority Conservation Actions for Coastal Plain Marsh

The following list of threats and priority conservation actions were identified for coastal plain marsh in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.5.3.2 unless otherwise indicated.

Threats and Issues

- Maintaining the natural hydrologic regime is essential for this community to persist.
- Shoreline disturbance and development can mean the loss of sensitive vegetation and the introduction of invasive plants.
- Ditching, dredging, filling, and various types of construction can seriously damage vegetation. Some of the native plants are rare and occur at only a few scattered but localized parts of Wisconsin. Chances that a species will recolonize a site from which it has been extirpated are low.

Priority Conservation Actions

- Protection of site hydrology and shorelines are the key factors to conserving this community type.
- Monitoring is needed for populations of rare or restricted species, and to determine the locations and abundance of invasive plants that are likely to spread and crowd out native vegetation.
- Work with private landowners via easements or other conservation agreements to protect shorelines and near-shore areas.
- Survey work to locate additional occurrences of this community is desirable, especially in the Central Sand Hills and Northwest Sands Ecological Landscapes.
- More detailed characterization of known occurrences is needed, to better define the type and enable comparisons with stands located to the east of Wisconsin.
- In recent years, rare invertebrates have been documented in some of the ponds associated with this community. Additional invertebrate survey work is warranted.
- Determine whether any of the sites of anthropogenic origin are viable, especially for rare or otherwise sensitive species.

3.3.8.5.3.2 Additional Considerations for Coastal Plain Marsh by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of coastal plain marsh exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for coastal plain marsh found in Section 3.3.8.5.3.1.

Additional Considerations for Coastal Plain Marsh in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

Central Sand Hills

Known occurrences are quite fragile, and a number of them are in private ownership. Notable examples of this community occur in the vicinity of Mud Lake (Waushara County) and Silver lake (Marquette County).

Additional Considerations for Coastal Plain Marsh in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

Central Sand Plains

Natural lakes are virtually absent from this Ecological Landscape, with the major exception of sloughs and backwaters that occur in the floodplains of the major rivers. The few known examples of this community type in the Central Sands are highly threatened by inappropriate use of off-road vehicles and hydrologic modifications, despite occurring on public land. There are numerous stands of anthropogenic origin. A subset of these should be monitored over time, to gain better understanding of the viability for rare species and conservation value over the long-term.

A single occurrence of this type has been found in the Western Coulee and Ridges Ecological Landscape, at Fort McCoy Military Reservation. The site, which is at least partially of human origin, is currently being protected by natural resource managers and the US Army. It is very close to the boundary of the Central Sand Plains Ecological Landscape, and the soils, topography, and vegetation surrounding the site are much more similar to that found in the Central Sand Plains than they are to that found in the Western Coulees and Ridges.

3.3.8.6 Emergent Aquatic

3.3.8.6.1 Community Overview

These open, marsh, lake, riverine and estuarine communities with permanent standing water are dominated by robust emergent macrophytes, in pure stands of single species or in various mixtures. Dominants include cattails, bulrushes (particularly *Scirpus acutus*, *S. fluviatilis*, and *S. validus*), bur-reeds, giant reed, pickerel-weed, water-plantains, arrowheads, the larger species of spikerush (such as *Eleocharis smallii*), and wild rice.

Aquatic plants, including both emergent and submergent aquatic vegetation, form the foundation of healthy and flourishing aquatic ecosystems - both within lakes and rivers and on the shores and wetlands around them. They not only protect water quality, but they also produce life-giving oxygen. Aquatic plants are a lake's own filtering system, helping to clarify the water by absorbing nutrients like phosphorus and nitrogen that could stimulate algal blooms. Plant beds stabilize soft lake and river bottoms and reduce shoreline erosion by reducing the effect of waves and current.

Aquatic plants also serve as spawning habitat for fish and amphibians, as shelter for various life stages of a variety of species, and as nesting habitat for birds. Plant beds support populations of aquatic insects that serve as a food base for other species. Seeds and other plant parts provide vital nutrition to a number of waterfowl and other bird species. Healthy, native aquatic plant communities also help prevent the establishment of invasive exotic plants like Eurasian watermilfoil.

3.3.8.6.2 Vertebrate Species of Greatest Conservation Need Associated with Emergent Aquatic

Thirty-nine vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with emergent aquatic (Table 3-183).

Table 3-183. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with emergent aquatic communities.

Species Significantly Associated with Emergent Aquatic
Birds
Red-necked Grebe
American Bittern
Great Egret
Snowy Egret
Trumpeter Swan
American Black Duck
Blue-winged Teal
Redhead
King Rail
Whooping Crane
Solitary Sandpiper
Hudsonian Godwit
Marbled Godwit
Short-billed Dowitcher
Wilson's Phalarope
Forster's Tern
Black Tern
Herptiles
Four-toed Salamander
Blanchard's Cricket Frog
Boreal Chorus Frog
Pickerel Frog
Mink Frog
Blanding's Turtle
Queen Snake
Butler's Garter Snake
Eastern Massasauga Rattlesnake
Mammals
Moose
Species Moderately Associated with Emergent Aquatic
Birds
Yellow-crowned Night Heron
American Golden Plover
Whimbrel
Dunlin
Buff-breasted Sandpiper
Common Tern
Rusty Blackbird
Herptiles
Western Ribbon Snake
Mammals
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-183 were subject to further analysis. The additional analysis identified the best

opportunities, by Ecological Landscape, for protection, restoration, and/or management of both emergent aquatic and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of emergent aquatic in each of the Ecological Landscapes (Tables 3-184 and 3-185).

- Using the analysis described above, a species was further selected if it had both a significant association with emergent aquatic and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of emergent aquatic. These species are shown in Figure 3-44.

Table 3-184. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with emergent aquatic communities and their association with Ecological Landscapes that support emergent aquatic.

Emergent Aquatic	Birds (17)*																	Herptiles (9)									Mammals (1)
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Red-necked Grebe	American Bittern	Great Egret	Snowy Egret	Trumpeter Swan	American Black Duck	Blue-winged Teal	Redhead	King Rail	Whooping Crane	Solitary Sandpiper	Hudsonian Godwit	Marbled Godwit	Short-billed Dowitcher	Wilson's Phalarope	Forster's Tern	Black Tern	Four-toed Salamander	Blanchard's Cricket Frog	Boreal Chorus Frog	Pickerel Frog	Mink Frog	Blanding's Turtle	Queen Snake	Butler's Garter Snake	Eastern Massasauga Rattlesnake	Moose
MAJOR																											
Central Sand Hills		■					■			■	▭	▭		■		■	■	▭			▭		■				
North Central Forest		■			■						▭						▭	■		■	▭	■					▭
Northern Highland		▭					▭				▭			■			■	■				■					▭
Northern Lake Michigan Coastal		▭	■	▭			■				▭	■	▭	■		■	■	▭			▭	■	▭				
Northwest Sands	▭	■			■		■				▭	▭	▭	■	▭		■	▭		■	▭	▭	■				
Southeast Glacial Plains	■	■		▭			■	■	■	■	▭	■	▭	■	▭	■	■	■			■		■	■	■	■	
Superior Coastal Plain		■			■		■				▭	▭	■	■			■	■		■	▭	■					▭
Western Coulee and Ridges			■				■		▭	▭	▭			■			▭	■	■		■		■			■	
Western Prairie	▭	▭	▭		■		■		▭		▭	▭	■	■			▭				▭		■				
IMPORTANT																											
Central Lake Michigan Coastal		▭	■	▭			■		▭		▭	■	▭	■	▭	■	■	■			▭		▭		▭		
Central Sand Plains	▭	■			■		■		▭	■	▭	▭		■	▭		■	■			▭		■			▭	
Forest Transition		■			■		■				▭	▭		■			■	■			▭						
Northeast Sands		▭									▭							▭			▭	■	▭				
Northwest Lowlands		■					▭				▭						▭	■		■	▭	■					▭
Southern Lake Michigan Coastal		▭					▭		▭		▭	▭	▭	■		■	■							▭	▭	■	
PRESENT (MINOR)																											
Southwest Savanna							▭				▭								■		■		■				

Color Key
■ = HIGH probability the species occurs in this Ecological Landscape
▭ = MODERATE probability the species occurs in this Ecological Landscape
▭ = LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

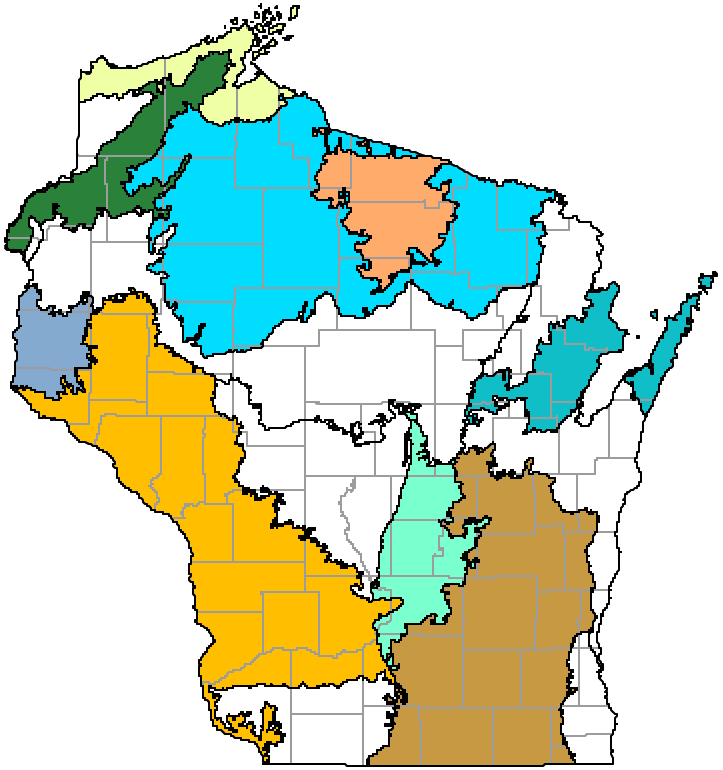
Table 3-185. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with emergent aquatic communities and their association with Ecological Landscapes that support emergent aquatic.

Emergent Aquatic	Birds (7)*							Herptiles (1)	Mammals (4)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Yellow-crowned Night-Heron	American Golden Plover	Whimbrel	Dunlin	Buff-breasted Sandpiper	Common Tern	Rusty Blackbird	Western Ribbon Snake	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
MAJOR												
Central Sand Hills		M		M			M		M	M	M	M
North Central Forest							M		M	H	M	H
Northern Highland		H		M	M		M				M	
Northern Lake Michigan Coastal		H	H	H	M	H	M		M	M	M	M
Northwest Sands		M		M			M					
Southeast Glacial Plains	M	H	M	H	H	H	H		M	M	M	M
Superior Coastal Plain		H	H	H	H	H	M		M	M	M	M
Western Coulee and Ridges	H	M			M		H		H	M	M	M
Western Prairie		M		M	M		M					
IMPORTANT												
Central Lake Michigan Coastal	M	M	H	H	M	H	M		M	M	M	M
Central Sand Plains		M		M			M		M	M	M	M
Forest Transition		H		M	M		M		M	M	H	M
Northeast Sands							M					
Northwest Lowlands							M		M	M	M	M
Southern Lake Michigan Coastal	M		H	H	H		M					
PRESENT (MINOR)												
Southwest Savanna		M			M		M		M		M	

Color Key
H = HIGH probability the species occurs in this Ecological Landscape
M = MODERATE probability the species occurs in this Ecological Landscape
= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-44. Vertebrate Species of Greatest Conservation Need that have *both* a significant association with emergent aquatic *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of emergent aquatic.



Central Sand Hills
American Bittern
Blue-winged Teal
Whooping Crane
Short-billed Dowitcher
Forster's Tern
Black Tern
Blanding's Turtle

North Central Forest
American Bittern
Trumpeter Swan
Four-toed Salamander
Boreal Chorus Frog
Mink Frog

Northern Highland
Short-billed Dowitcher
Black Tern
Four-toed Salamander
Mink Frog

Northern Lake Michigan Coastal
Great Egret
Blue-winged Teal
Hudsonian Godwit
Short-billed Dowitcher
Forster's Tern
Black Tern
Mink Frog

Northwest Sands
American Bittern
Trumpeter Swan
Blue-winged Teal
Short-billed Dowitcher
Black Tern
Boreal Chorus Frog
Blanding's Turtle

Southeast Glacial Plains
Red-necked Grebe
American Bittern
Blue-winged Teal
Redhead
King Rail
Whooping Crane
Hudsonian Godwit
Short-billed Dowitcher
Forster's Tern
Black Tern
Four-toed Salamander
Pickerel Frog
Blanding's Turtle
Queen Snake
Butler's Garter Snake
Eastern Massasauga Rattlesnake

Superior Coastal Plain
American Bittern
Trumpeter Swan
Blue-winged Teal
Marbled Godwit
Short-billed Dowitcher
Black Tern
Four-toed Salamander
Boreal Chorus Frog
Mink Frog

Western Coulees and Ridges
Great Egret
Blue-winged Teal
Short-billed Dowitcher
Four-toed Salamander
Blanchard's Cricket Frog
Pickerel Frog
Blanding's Turtle
Eastern Massasauga Rattlesnake

Western Prairie
Trumpeter Swan
Blue-winged Teal
Marbled Godwit
Short-billed Dowitcher
Blanding's Turtle

3.3.8.6.3 Threats and Priority Conservation Actions for Emergent Aquatic

3.3.8.6.3.1 Statewide Overview of Threats and Priority Conservation Actions for Emergent Aquatic

The following list of threats and priority conservation actions were identified for emergent aquatic in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.6.3.2 unless otherwise indicated.

Threats and Issues

- Disturbance from recreational powerboats can cause sedimentation and physical damage to aquatic plants.
- Weed removal and use of pesticides damage habitat and encourage invasives.
- Lakeshore/rivershore development can alter shoreline habitat and increase erosion.
- Sedimentation, eutrophication, and pollution of water can cause detrimental changes to community composition, structure, and function. Mercury, polychlorinated biphenyls and other pollutants are a serious issue in some northern Ecological Landscapes (e.g., Northern Highland, Northern Lake Michigan Coastal, Northwest Sands, and Northwest Lowlands).
- Invasive plants can replace native plants and affect aquatic communities.
- Dams and impoundments can raise water levels to the detriment of this community type.

Priority Conservation Actions

- This community type should be managed as a complex with other forest and wetland types.
- Protect more of this community type by working with conservation managers and interest groups.
- Consider adopting no-wake zones to protect vegetation.
- Buffer uplands and manage shorelines to prevent erosion and sedimentation, and to limit pollutant inputs.
- Restore shorelines where feasible.
- Restore hydrology where possible. Maintain cycles of fluctuating water levels, based on additional studies that characterize appropriate cycles and timing.
- Additional surveys are needed to locate high quality community occurrences and rare species' populations on shorelines and in associated marsh habitats. Plot sample data are needed for documentation of species composition and diversity.
- Attach Sensitive Area Designation to sites that meet the criteria of that designation, as one means to protect emergent plant communities from degradation caused by human activity.
- Continue and support research to find biocontrols for invasives; control spread of new invasives. Control existing invasives on a site-by-site basis.

3.3.8.6.3.2 Additional Considerations for Emergent Aquatic by Ecological Landscape

Special considerations have also been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of emergent aquatic exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for emergent aquatic found in Section 3.3.8.6.3.1.

Additional Considerations for Emergent Aquatic in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

Central Sand Hills

Invasive plants (e.g., reed canary grass, giant reed and purple loosestrife) can replace native plants and affect aquatic communities. Effects of past management (e.g., filling marshes) are very evident in this Ecological Landscape. Grassy Lake Wildlife Area (Columbia County) and Lawrence Creek State Natural Area (Marquette County) are examples of high quality emergent aquatic communities here.

North Central Forest

Invasive plants (e.g., purple loosestrife) can replace native plants. Dams have raised water levels and affected this community type in some sites but created marsh habitat in locations further upstream. Totagatic Lake (Bayfield County) is a quality site.

Northern Highland

This Ecological Landscape contains some unique and sensitive marsh types. Large areas in public ownership help to ensure the viability of this community here. Frog Lake and Pine State Natural Area (Iron County) showcase high quality examples of this type.

Northern Lake Michigan Coastal

Significant alterations to wetlands have impacted this community here, but some restoration attempts have restored this community in wildlife areas along the west shore of Green Bay, to the benefit of fish such as northern pike. Mink River Estuary and the Dunes Lake area (both in Door County) contain intact examples of emergent marsh.

Northwest Sands

Cranberry operations, though currently limited here, have the potential to decrease the amount of wetland habitat, alter natural communities, and affect local hydrology and water quality. An appreciable number of lakes still support viable emergent aquatic communities here. Some of the larger marshes in this Ecological Landscape occur along impounded portions of rivers or small streams. Good examples of the emergent marsh community include the Gordon Flowage on the St. Croix River (Burnett County) and some of the managed flowages at Crex Meadows (Wood County).

Southeast Glacial Plains

Invasive plants (e.g., Phragmites, reed canary grass, purple loosestrife, flowering rush, glossy buckthorn, narrow-leaved cattail) can replace native plants and affect aquatic communities. Many marshes are becoming highly dominated by cattails. Botulism is a concern when oxygen content is low. Remaining lead shot in hard-bottomed water bodies still occasionally results in poisoning. Carp are a threat, and so are effects of carp control efforts. There are continuing effects of past management (e.g., draining and filling marshes).

This Ecological Landscape formerly included many marshes. It is among the best Ecological Landscapes regarding the potential for restoring and managing this type. Existing sites include Horicon Marsh (Dodge County) (and the satellite Fox River Crane Marsh), Rush Lake and Fox River marshes (Winnebago County), many Wildlife Areas, and a number of Waterfowl Production Areas. Restoration areas include

the Glacial HRA (Fond du Lac County) (using the wetland reserve program). Formerly drained wetlands (e.g., muck farms) have been recently purchased and may be converted and managed as marsh. More of this community type should be protected by working with conservation managers and interest groups. Watersheds should be managed to control runoff from surrounding agricultural areas that may contribute nutrients and sediment. Drawdowns for shorebird management are effective, but the needs of amphibians and reptiles should be considered; consider timing drawdowns to reduce the threat of botulism. These sites should be monitored to determine whether management is maintaining native diversity and the effects of non-native cattails should be researched.

Superior Coastal Plain

Disturbance from recreational powerboats coming into rivers from Lake Superior can cause sedimentation and physical damage to aquatic plants. Eutrophication (in St. Louis River estuary, Port Wing) can cause detrimental changes to community structure. Invasive plants (e.g., purple loosestrife, Phragmites, reed canary grass) have replaced native plants. Soil erosion and sedimentation from uplands into water bodies is a particular threat in this Ecological Landscape due to the erodible soils. Agriculture, impermeable surfaces, and lack of conifers contribute to peakflow episodes during spring snowmelt. Unsustainable forest management practices can result in soil erosion and water quality issues.

This type is primarily associated with coastal embayments on Lake Superior. Inland lakes are scarce in this Ecological Landscape. Uplands within the watershed should be reforested, restoring conifers where possible. Best Management Practices and other sustainable forest management practices should be used to limit detrimental soil and water effects. Adaptive management techniques should be used to restore structure and composition. More information on land use in the watershed should be gathered and effects on peakflows into emergent aquatic community sites should be researched.

Western Coulees and Ridges

Development on ridges above rivers can alter shoreline habitat and increase erosion. Rip-rapping, levees, seawalls, and dikes have been constructed (these have some positive effects in protecting marshes behind dikes). Invasive plants (e.g., reed canary grass, purple loosestrife) can replace native plants. Invasive animals (e.g., common carp) are also a problem for this community type. An astounding abundance of dams in this Ecological Landscape raised water levels to eliminate this community type in some sites, but created marsh habitat in other locations. Dams also change timing and duration of water level fluctuations. Barge traffic on the Mississippi requires dredging and disposal of materials, which stirs up bottom sediments, and results in wave impacts. Past drainage for agricultural uses, and filling for roads, railroads, and industrial sites, reduced marsh habitat. Competing economic interests limit opportunities for this type in the Ecological Landscape, especially in the Mississippi River valley.

The Mississippi River corridor is of continental importance to migratory waterfowl. This community is found primarily in the backwaters of large rivers (e.g., Mississippi (Grant, Crawford, Pepin, Pierce, Trempealeau Counties), Chippewa (Pepin and Buffalo Counties), Wisconsin (Crawford and Grant Counties), and Black Rivers (LaCrosse County)). Emergent marsh should be managed as a complex with floodplain forest, submergent marsh, wet meadow, shrub-carr, and adjoining uplands. Advocating for river flow management and other actions that are more beneficial to emergent plant communities, fish and wildlife should be continued. The Chippewa River Bottoms (Buffalo County) and the Trempealeau Delta (Trempealeau County) are examples of healthy emergent aquatic communities.

Western Prairie

Development on hilltops above rivers can alter shoreline habitat and increase erosion. Increasing human population levels due to the expansion of the nearby Twin Cities metropolitan area has resulted in rapidly increasing development. Agricultural practices are often used too close to pothole habitat. Invasive plants (e.g., reed canary grass, purple loosestrife) can replace native plants. Invasive animals (e.g., carp) are also a problem for this community type. Raising baitfish in potholes is a threat. There are few dams in this Ecological Landscape, but some large ones exist on the Willow and Apple Rivers, and may have raised water levels to eliminate this community type in some sites and create marsh habitat in other locations. Dams also change the timing and duration of fluctuations in water levels. Past drainage for agricultural use reduced marsh habitat. Past filling for roads and railroads has impacted the community type by altering hydrology.

This community is found in this Ecological Landscape primarily in pothole lakes and also on backwaters of the St Croix River (Pierce County). Historically, this Ecological Landscape was the only part of the state where prairie potholes were found. Emergent pothole vegetation has dwindled in remaining potholes; the few remaining sites should be preserved and managed as a complex with other grassland or prairie communities, and floodplain forests along the St. Croix River. Incentives should be provided to buffer potholes with prairie or grassland to protect the emergent aquatic community. Detrimental recreational activities on the St. Croix River should be excluded by such means as creating no-wake zones near sensitive marsh habitat. Uplands should be buffered and shorelines should be managed to prevent erosion and sedimentation, and limit pollutant inputs. Shorelines should be restored where possible. Introduction of baitfish into potholes, which disrupts amphibian, invertebrate, and other components of these communities, should be controlled. The St. Croix Islands Wildlife Area (St. Croix County) remains a high quality example of this community.

Additional Considerations for Emergent Aquatic in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

Central Lake Michigan Coastal

Invasive plants (e.g., Phragmites, reed canary grass, purple loosestrife) can replace native plants and affect aquatic communities. Continuing effects of past management (e.g., filling marshes) are evident. Grass Lake (Calument County) supports a good emergent aquatic community. Kewaunee River Marsh (Kewaunee County) and Little Tail Point (Brown County) are examples of other emergent communities in public ownership.

Central Sand Plains

Many streams have been hydrologically altered and marshes drained here for various agricultural purposes. Research may be necessary to determine whether emergent communities can be restored under this scenario of flow alteration. Windy Run and Marsh (Clark County) and Monroe County Flowage in the Meadow Valley Wildlife Area are examples of this community here.

Forest Transition

Invasive plants (e.g., purple loosestrife) can replace native plants. Dams have raised water levels to eliminate this community type in some sites but also create marsh habitat in other locations. Drainage for

agricultural use reduced marsh habitat. Pope Lake (Waushara County) and Tenmile Creek Marsh (Rusk County) typify this community here.

Northeast Sands

Development on popular lakes may pose a threat to this community. Utricularia Bay on Warrington Lake (Oconto County) is an excellent example of this community type here, and several others are protected on the Menominee reservation. The ability of lake classification to protect remaining populations of emergent vegetation on lakes subject to housing development and recreational use should be investigated.

Northwest Lowlands

Most problems due to lakeshore development and recreational use are associated with the larger developed lakes. Invasive plants (e.g., purple loosestrife) have replaced native plants in some areas. Pockets of marsh exist along lake and stream shores, as well as state-managed wildlife flowages (Douglas County).

Southern Lake Michigan Coastal

Increasing population levels due to proximity to the expanding Milwaukee metropolitan area continue to drive rapidly increasing development and land use conversion. Land use planning that is not comprehensive and does not emphasize conservation considerations can lead to development in locations that limit options for restoring and managing this community. Continuing effects of past management (e.g., filling marshes) are evident on the landscape, and pose barriers to restoring this community here. Past drainage for agricultural use reduced marsh habitat. Agricultural activities in close proximity to water bodies have led to sedimentation, eutrophication, and increased runoff, causing detrimental changes to community structure. Runoff is likely increasing due to development and increases in impervious surface area. Invasive plants (e.g., Phragmites, reed canary grass, purple loosestrife) can replace native plants and affect aquatic communities. Invasive animals (e.g., carp, rusty crayfish) are also a problem for this community type.

Use of existing land use plans that call for conservation actions should be encouraged. Watersheds should be managed to control runoff that may contribute nutrients and sediment. Brighton Marsh and Woodland (Kenosha County) and Mission Hills Wetlands (Milwaukee County) are good examples of this community in southeast Wisconsin.

3.3.8.7 Emergent Aquatic – Wild Rice

3.3.8.7.1 Community Overview

Emergent aquatic – wild rice is closely related to the emergent aquatic community, but has wild rice as the dominant macrophyte. Substrates supporting wild rice usually consist of poorly-consolidated, semi-organic sediments. Water fertility is low to moderate, and a slow current is present. Wild rice beds have great cultural significance to native peoples, and are important wildlife habitats.

3.3.8.7.2 Vertebrate Species of Greatest Conservation Need Associated with Emergent Aquatic – Wild Rice

Nine vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with emergent aquatic - wild rice (Table 3-186).

Table 3-186. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with emergent aquatic - wild rice communities.

Species Significantly Associated with Emergent Aquatic - Wild Rice
Birds
Trumpeter Swan
Herptiles
Blanding's Turtle
Species Moderately Associated with Emergent Aquatic - Wild Rice
Birds
American Black Duck
Blue-winged Teal
Canvasback
Redhead
Lesser Scaup
Black Tern
Herptiles
Mink Frog

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-186 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both emergent aquatic - wild rice and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of emergent aquatic - wild rice in each of the Ecological Landscapes (Tables 3-187 and 3-188).

- Using the analysis described above, a species was further selected if it had both a significant association with emergent aquatic - wild rice and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of emergent aquatic - wild rice. These species are shown in Figure 3-45.

Table 3-187. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with emergent aquatic - wild rice communities and their association with Ecological Landscapes that support emergent aquatic - wild rice.

Emergent Aquatic - Wild Rice	Birds (1)*	Herptiles (1)
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Trumpeter Swan	Blanding's Turtle
MAJOR		
Northern Highland		
Northwest Sands		
Superior Coastal Plain		
IMPORTANT		
North Central Forest		
Southeast Glacial Plains		
Western Coulee and Ridges		
PRESENT (MINOR)		
Central Lake Michigan Coastal		
Central Sand Hills		
Central Sand Plains		
Forest Transition		
Northeast Sands		
Northern Lake Michigan Coastal		
Western Prairie		

Color Key

= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-188. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with emergent aquatic - wild rice communities and their association with Ecological Landscapes that support emergent aquatic - wild rice.

Emergent Aquatic - Wild Rice	Birds (6)*						Herptiles (1)
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	American Black Duck	Blue-winged Teal	Canvasback	Redhead	Lesser Scaup	Black Tern	Mink Frog
MAJOR							
Northern Highland		MODERATE	MODERATE		HIGH	HIGH	HIGH
Northwest Sands		HIGH	MODERATE		HIGH	HIGH	MODERATE
Superior Coastal Plain		HIGH	MODERATE		HIGH	HIGH	HIGH
IMPORTANT							
North Central Forest			MODERATE		HIGH	MODERATE	HIGH
Southeast Glacial Plains		HIGH	HIGH	HIGH	HIGH	HIGH	
Western Coulee and Ridges		HIGH	HIGH		HIGH	MODERATE	
PRESENT (MINOR)							
Central Lake Michigan Coastal		HIGH	MODERATE		HIGH	HIGH	
Central Sand Hills		HIGH				HIGH	
Central Sand Plains		HIGH	MODERATE		HIGH	HIGH	
Forest Transition		HIGH	MODERATE		HIGH	HIGH	
Northeast Sands							HIGH
Northern Lake Michigan Coastal		HIGH	HIGH		HIGH	HIGH	HIGH
Western Prairie		HIGH	MODERATE		MODERATE	MODERATE	

Color Key

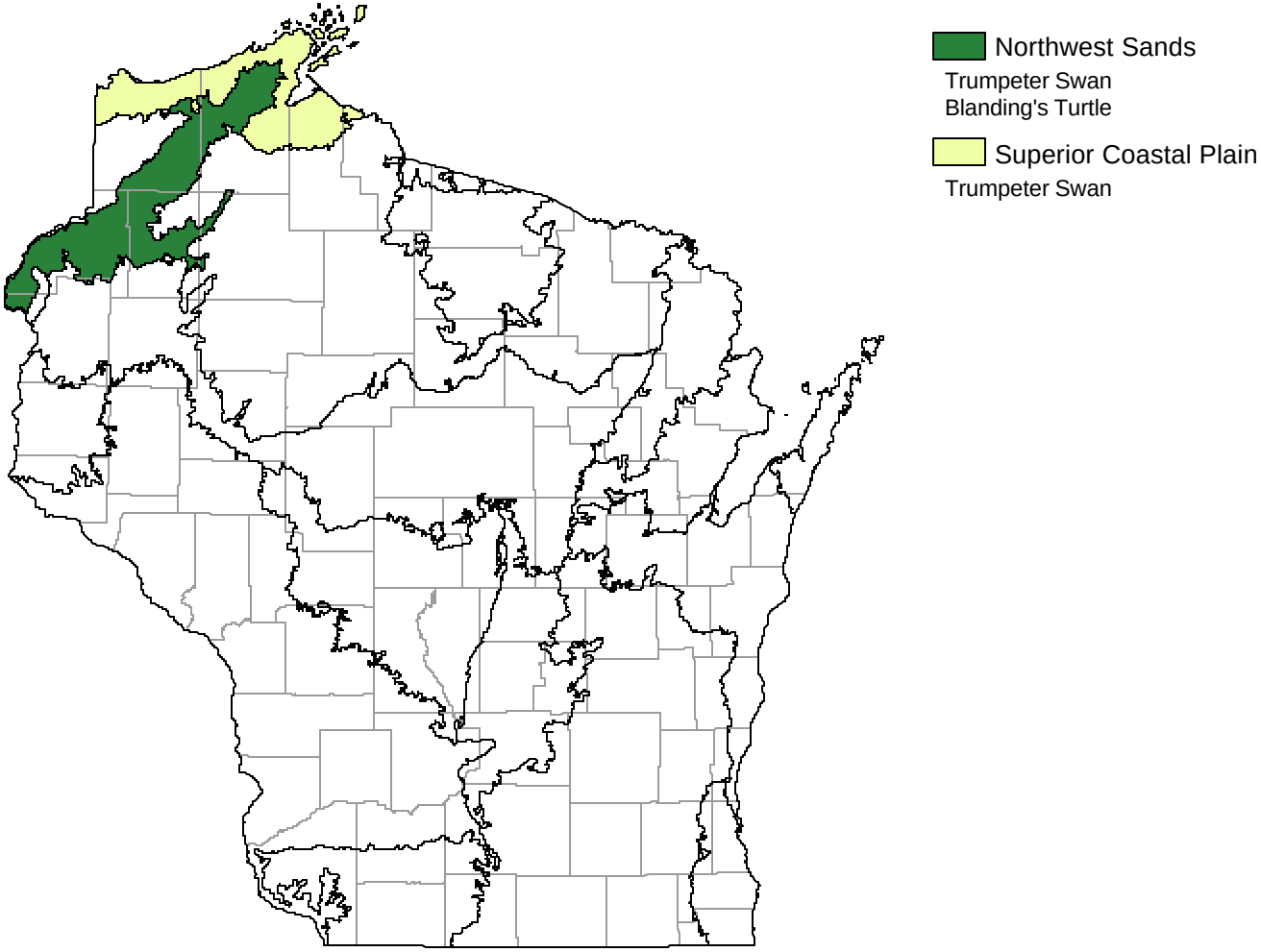
HIGH = HIGH probability the species occurs in this Ecological Landscape

MODERATE = MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-45. Vertebrate Species of Greatest Conservation Needthat have *both* a significant association with emergent aquatic - wild rice *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of emergent aquatic - wild rice.



3.3.8.7.3 Threats and Priority Conservation Actions for Emergent Aquatic – Wild Rice

3.3.8.7.3.1 Statewide Overview of Threats and Priority Conservation Actions for Emergent Aquatic – Wild Rice

The following list of threats and priority conservation actions were identified for emergent aquatic-wild rice in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.7.3.2 unless otherwise indicated.

Threats and Issues

- Disturbance from recreational powerboats can cause sedimentation and physical damage to aquatic plants.
- Weed removal and use of pesticides damage habitat and encourage invasives.
- Lakeshore/rivershore development can alter shoreline habitat and increase erosion.
- Sedimentation, eutrophication, and pollution of water can cause detrimental changes to community composition, structure, and function. Mercury, polychlorinated biphenyls and other pollutants are a serious issue in some northern Ecological Landscapes (e.g., Northern Highland, Northern Lake Michigan Coastal, Northwest Sands, and Northwest Lowlands).
- Invasive plants can replace native plants and affect aquatic communities.
- Dams and impoundments can raise water levels to the detriment of this community type.

Priority Conservation Actions

- This community type should be managed as a complex with other forest and wetland types.
- Protect more of this community type by working with conservation managers and interest groups.
- Consider adopting no-wake zones to protect vegetation.
- Buffer uplands and manage shorelines to prevent erosion and sedimentation, and to limit pollutant inputs.
- Restore shorelines where feasible.
- Restore hydrology where possible. Maintain cycles of fluctuating water levels, based on additional studies that characterize appropriate cycles and timing.
- Additional surveys are needed to locate high quality community occurrences and rare species' populations on shorelines and in associated marsh habitats. Plot sample data are needed for documentation of species composition and diversity.
- Continue and support research to find biocontrols for invasives; control spread of new invasives. Control existing invasives on a site-by-site basis.
- Continue current system of tribal and state rice bed restoration and harvest regulation, and evaluate the benefits of expanding this oversight to other rice-bearing water bodies.

3.3.8.7.3.2 Additional Considerations for Emergent Aquatic-Wild Rice by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of emergent aquatic–wild rice exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for emergent aquatic-wild rice found in Section 3.3.8.7.3.1.

Additional Considerations for Emergent Aquatic-Wild Rice in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

Northern Highland

This Ecological Landscape contains some unique and sensitive marsh types. It is one of the state's most important for the maintenance and protection of wild rice beds. Large areas in public ownership help to ensure the viability of this community here. Wild rice still occurs on numerous lakes; however, intensive lakeshore development has significantly degraded some areas. Tribal members and other citizens gather significant quantities of wild rice here. Wild rice should be protected and restored where possible, seeking partnerships with Great Lakes Indian Fish and Wildlife Commission and other entities as appropriate. Aurora Lake and Wetlands (Vilas County) supports a healthy wild rice population.

Northwest Sands

Cranberry operations, though currently limited here, have the potential to decrease the amount of wetland habitat, alter natural communities, and affect local hydrology and water quality. An appreciable number of lakes still support viable wild rice beds. Some of the larger marshes in this Ecological Landscape occur along impounded portions of rivers or small streams. Protect and restore wild rice where appropriate, in coordination with tribal projects if possible.

Superior Coastal Plain

Disturbance from recreational powerboats coming into rivers from Lake Superior can cause sedimentation and physical damage to aquatic plants as well as problematic social interactions. Eutrophication (in St. Louis River estuary, Port Wing) can cause detrimental changes to community structure. Invasive plants (e.g., purple loosestrife, Phragmites, reed canary grass) have replaced native plants in some areas. Soil erosion and sedimentation from uplands into water bodies is a particular threat in this Ecological Landscape due to the erodible soils. Agriculture, impermeable surfaces, and lack of conifers contribute to peakflow episodes during spring snowmelt. Unsustainable forest management practices can result in soil erosion and water quality issues.

Wild rice should be restored where possible; rice beds in the Kakagon Sloughs (Ashland County) should be protected and maintained. Uplands within the watershed should be reforested, restoring conifers where possible. Best Management Practices and other sustainable forest management practices should be used to limit detrimental soil and water effects. Adaptive management techniques should be used to restore structure and composition. More information on land use in the watershed should be gathered and effects on peakflows into emergent aquatic community sites should be researched.

Additional Considerations for Emergent Aquatic-Wild Rice in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

North Central Forest

Invasive plants (e.g., purple loosestrife) can replace native plants. Dams have raised water levels and affected this community type in some sites but created marsh habitat in locations further upstream. Wild rice should be protected and restored where appropriate. Wabikon Lake (Forest County) supports a valuable wild rice population and Swamp Creek (Forest County) contains important wild rice stands.

Southeast Glacial Plains

Invasive plants (e.g., Phragmites, reed canary grass, purple loosestrife, flowering rush, glossy buckthorn, narrow-leaved cattail) can replace native plants and affect aquatic communities. Many marshes are becoming highly dominated by cattails. Botulism is a concern when oxygen content is low. Remaining lead shot in hard-bottomed water bodies still occasionally results in poisoning. Carp are a threat, and so are effects of carp control efforts. There are continuing effects of past management (e.g., draining and filling marshes, loss of wild rice).

This Ecological Landscape formerly included many marshes that supported wild rice. The Wolf River Wildlife Area (Winnebago County) still supports a good population of rice. Wild rice should be restored if possible (although most systems are too hydrologically altered and sediment-filled to support wild rice). Watersheds should be managed to control runoff from surrounding agricultural areas that may contribute nutrients and sediment. Drawdowns for shorebird management are effective, but the needs of amphibians and reptiles should be considered; consider timing drawdowns to reduce the threat of botulism. These sites should be monitored to determine whether management is maintaining native diversity and the effects of non-native cattails should be researched.

Western Coulee and Ridges

Development on ridges above rivers can alter shoreline habitat and increase erosion. Rip-rapping, levees, seawalls, and dikes have been constructed (these have some positive effects in protecting marshes behind dikes). Invasive plants (e.g., reed canary grass, purple loosestrife) can replace native plants. Invasive animals (e.g., common carp) are also a problem for this community type. An astounding abundance of dams in this Ecological Landscape raised water levels to eliminate this community type in some sites, but created marsh habitat in other locations. Dams also change timing and duration of water level fluctuations. Barge traffic on the Mississippi requires dredging and disposal of materials, which stirs up bottom sediments, and results in wave impacts. Past drainage for agricultural uses, and filling for roads, railroads, and industrial sites, reduced marsh habitat. Competing economic interests limit opportunities for this type in the Ecological Landscape, especially in the Mississippi River valley.

Wild rice should be protected and restored where appropriate. The Mississippi River corridor is of continental importance to migratory waterfowl. This community is found primarily in the backwaters of large rivers (e.g., Mississippi (Grant, Crawford, Pepin, Pierce, Trempealeau Counties), Chippewa (Pepin and Buffalo Counties), Wisconsin (Crawford and Grant Counties), and Black Rivers (LaCrosse County)). This community should be managed as a complex with floodplain forest, submergent marsh, wet meadow, shrub-carr, and adjoining uplands. Advocating for river flow management and other actions that are more beneficial to emergent plant communities, fish, and wildlife should continue.

3.3.8.8 Ephemeral Ponds

3.3.8.8.1 Community Overview

These ponds are depressions with impeded drainage (usually in forest landscapes), that hold water for a period of time following snowmelt and spring rains but typically dry out by mid-summer. Common wetland plants found in this community (as well as other types) include yellow water crowfoot, mermaid weed, Canada bluejoint grass, floating manna grass, spotted cowbane, smartweeds, orange jewelweed, and sedges. They flourish with productivity during their brief existence and provide critical breeding habitat for certain invertebrates, as well as for many amphibians such as wood frogs and salamanders. They also provide feeding, resting and breeding habitat for songbirds and a source of food for many mammals. Ephemeral ponds contribute in many ways to the biodiversity of a woodlot, forest stand and the larger landscape. There have been many definitions and synonyms for the term ephemeral pond (e.g., "vernal pool"). However, they all broadly fit into a community context by the following attributes: their placement in woodlands, isolation, small size, hydrology, length of time they hold water, and composition of the biological community (lacking fish as permanent predators).

Trees adjacent to ephemeral ponds provide a variety of benefits such as maintaining cool water temperatures, preventing premature drying, and adding to the food web. The annual input of leaves from trees around the pool support a detritus-based food web and a variety of invertebrates that are part of that food web.

3.3.8.8.2 Vertebrate Species of Greatest Conservation Need Associated with Ephemeral Ponds

Sixteen vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with ephemeral ponds (Table 3-189).

Table 3-189. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with ephemeral pond communities.

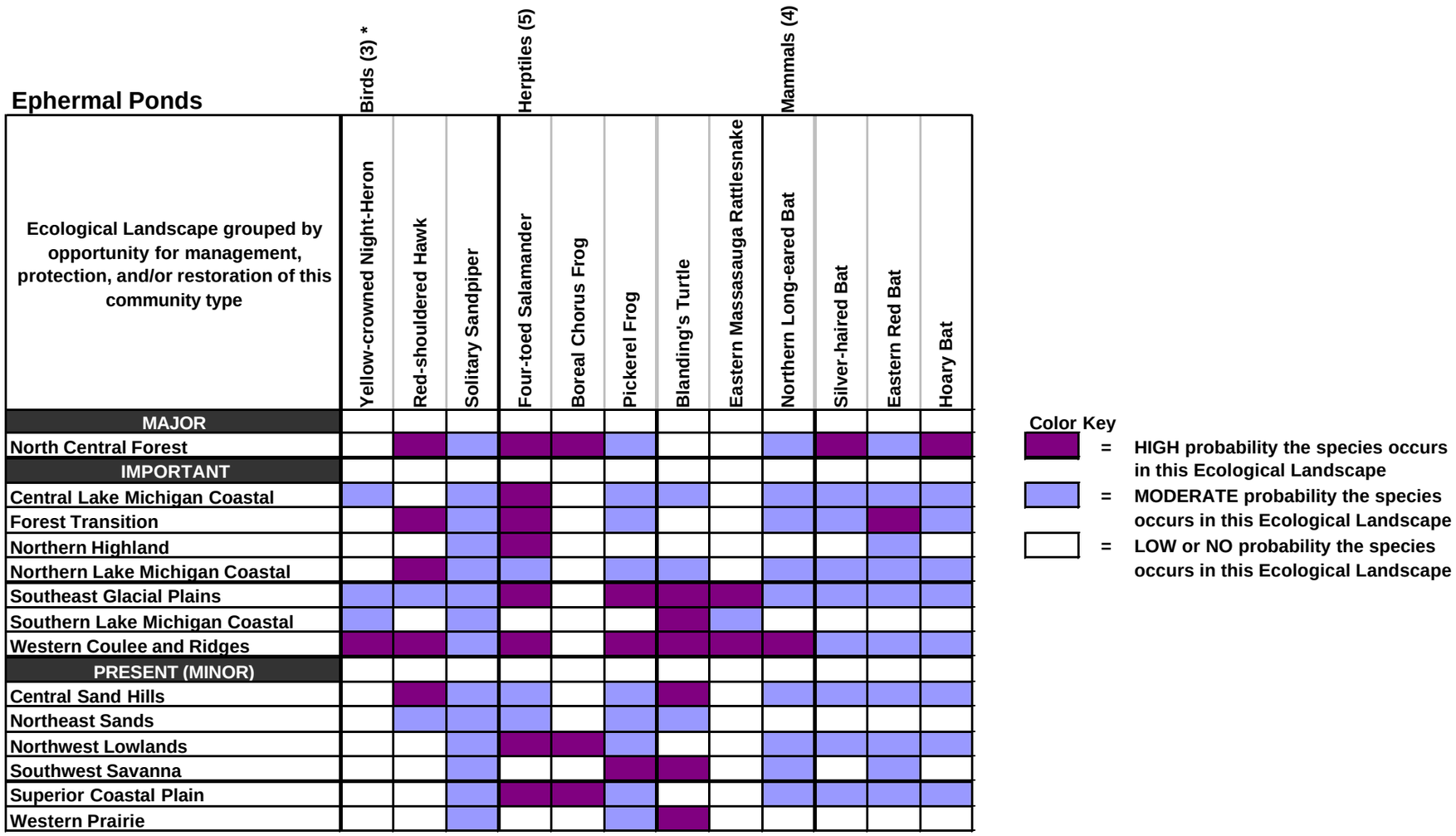
Species Significantly Associated with Ephemeral Ponds
Birds
Yellow-Crowned Night-heron
Red-shouldered Hawk
Solitary Sandpiper
Herptiles
Four-toed Salamander
Boreal Chorus Frog
Pickerel Frog
Blanding's Turtle
Eastern Massasauga Rattlesnake
Mammals
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat
Species Moderately Associated with Ephemeral Ponds
Birds
Rusty Blackbird
Herptiles
Mink Frog
Wood Turtle
Mammals
Woodland Jumping Mouse

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-189 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both ephemeral ponds and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of ephemeral ponds in each of the Ecological Landscapes (Tables 3-190 and 3-191).

- Using the analysis described above, a species was further selected if it had both a significant association with ephemeral ponds and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of ephemeral ponds. These species are shown in Figure 3-46.

Table 3-190. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with ephemeral pond communities and their association with Ecological Landscapes that support ephemeral ponds.



Ephermal Ponds	Birds (3) *			Herptiles (5)					Mammals (4)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Yellow-crowned Night-Heron	Red-shouldered Hawk	Solitary Sandpiper	Four-toed Salamander	Boreal Chorus Frog	Pickerel Frog	Blanding's Turtle	Eastern Massasauga Rattlesnake	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
MAJOR												
North Central Forest		H	M	H	H	M			M	H	M	H
IMPORTANT												
Central Lake Michigan Coastal	M		M	H		M	M		M	M	M	M
Forest Transition		H	M	H		M			M	M	H	M
Northern Highland			M	H							M	
Northern Lake Michigan Coastal		H	M	M		M	M		M	M	M	M
Southeast Glacial Plains	M	M	M	H		H	H	H	M	M	M	M
Southern Lake Michigan Coastal	M		M				H	M				
Western Coulee and Ridges	H	H	M	H		H	H	H	H	M	M	M
PRESENT (MINOR)												
Central Sand Hills		H	M	M		M	H		M	M	M	M
Northeast Sands		M	M	M		M	M					
Northwest Lowlands			M	H	H	M			M	M	M	M
Southwest Savanna			M			H	H		M		M	
Superior Coastal Plain			M	H	H	M			M	M	M	M
Western Prairie			M			M	H					

Color Key

H = HIGH probability the species occurs in this Ecological Landscape

M = MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-191. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with ephemeral pond communities and their association with Ecological Landscapes that support ephemeral ponds.

Ephermal Ponds	Birds (1)*	Herptiles (2)		Mammals (1)
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Rusty Blackbird	Mink Frog	Wood Turtle	Woodland Jumping Mouse
MAJOR				
North Central Forest				
IMPORTANT				
Central Lake Michigan Coastal				
Forest Transition				
Northern Highland				
Northern Lake Michigan Coastal				
Southeast Glacial Plains				
Southern Lake Michigan Coastal				
Western Coulee and Ridges				
PRESENT (MINOR)				
Central Sand Hills				
Northeast Sands				
Northwest Lowlands				
Southwest Savanna				
Superior Coastal Plain				
Western Prairie				

Color Key

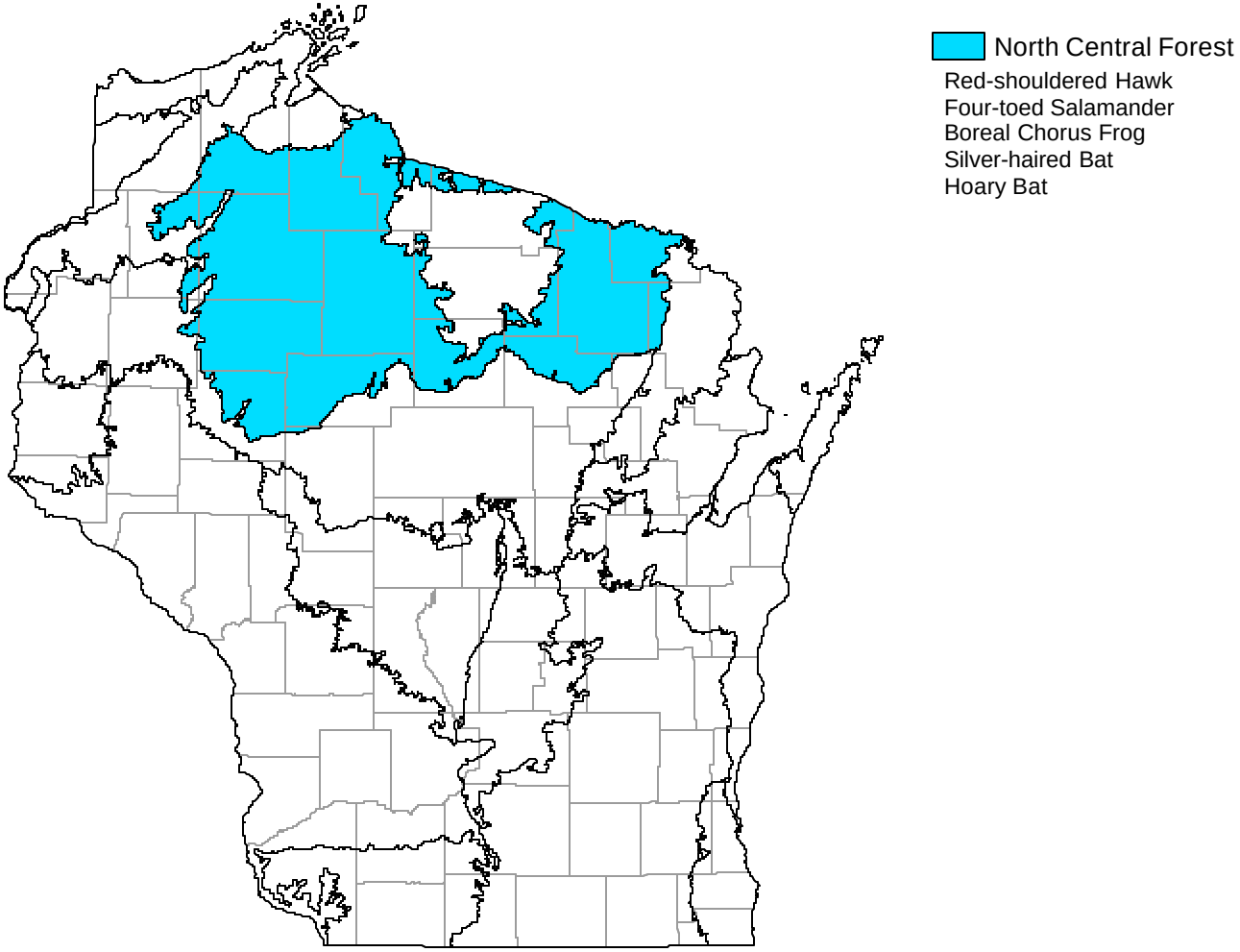
= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-46. Vertebrate Species of Greatest Conservation Needthat have *both* a significant association with ephemeral ponds *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of ephemeral ponds.



3.3.8.8.3 Threats and Priority Conservation Actions for Ephemeral Ponds

3.3.8.8.3.1 Statewide Overview of Threats and Priority Conservation Actions for Ephemeral Ponds

The following list of threats and priority conservation actions were identified for ephemeral ponds in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.8.3.2 unless otherwise indicated.

Threats and Issues

- Past land use practices (Cutover-era logging, agriculture) have resulted in the loss of or damage to this community.
- Unsustainable forest management practices can result in soil compaction, rutting, and erosion. The practice of piling slash in ephemeral ponds can reduce their utility to some organisms and ultimately lead to filling them prematurely.
- Forest fragmentation and development have also resulted in the loss of this community and its utility to species that breed in the ponds and spend the growing season in the surrounding forest.
- Invasive species can be a problem in some areas, especially on pond margins, where flooding might not occur every year (i.e., buckthorns, Asian honeysuckles, moneywort, and garlic mustard.
- Motorized recreation and high road densities contribute to rutting and alteration of the community.
- Long-term changes in climate can affect the existence of this community type and the species that rely on this temporal community.
- Many ephemeral ponds have not been inventoried or mapped due to their tendency toward relatively small sizes and seasonal occurrence. As a result, they may go overlooked and be inadvertently missed during regulatory processes.

Priority Conservation Actions

- Apply Best Management Practices for Water Quality during forest harvest operations.
- Emphasize land management that protects against the introduction of invasive species. If patches of invasive plants can be identified early, control measures are more likely to succeed.
- Limit motorized recreation near ephemeral pools and plan infrastructure with protection measures in mind.
- With each forest management plan, incorporate buffers and maintain long-lived tree species around ponds. Also consider leaving connecting strips from riparian zones to the pond for amphibian travel corridors. Prior to establishing a timber sale, ephemeral ponds should be mapped out.
- Stronger guidelines are needed for foresters and other managers to clarify the ecological values of this community and develop the most appropriate management practices.
- There is a statewide need for more comprehensive information on ephemeral ponds, including inventory, mapping, and monitoring of this community. Vascular plants, invertebrates, herptiles, and abiotic attributes should all be targets of broader survey efforts.
- Better inventory techniques and guidelines should be developed to ensure that ephemeral ponds are afforded appropriate regulatory consideration.

3.3.8.8.3.2 Additional Considerations for Ephemeral Ponds by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of ephemeral pond exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for ephemeral ponds found in Section 3.3.8.8.3.1.

Additional Considerations for Ephemeral Ponds in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

North Central Forest

Ephemeral ponds are found within the northern dry, northern dry-mesic, and northern mesic community types and are most abundant in the latter type. Flambeau River State Forest (Sawyer, Rusk and Price Counties), Chequamegon-Nicolet National Forests and many county forests contain ephemeral ponds within a forest matrix. Ephemeral ponds are often found in relation to other water features on the landscape, such as the Wisconsin, Flambeau, Chippewa, Bad, and White Rivers. Invasive plants are becoming a threat especially where motorized recreation occurs within this community. If detected early, small isolated patches of invasive plants may successfully be controlled. Forest management provides an opportunity to identify these isolated communities and protect them prior to timber sale establishment.

Additional Considerations for Ephemeral Ponds in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

Central Lake Michigan Coastal

Loss of forest cover, forest fragmentation, and widespread development have altered this community.

Forest Transition

Loss of forest cover, forest fragmentation, and development have altered this community. Because of the fine textured soils present in some parts of this Ecological Landscape, there may be locally important opportunities to manage for and protect this habitat.

Northern Highland

Ephemeral ponds are found within a heterogeneous forest matrix of northern dry, northern dry-mesic and northern mesic community types, and are usually associated with other wetland features, i.e., corridors connecting to ponds.

Northern Lake Michigan Coastal

The loss of forest cover, forest fragmentation, and development have altered this community and diminished management opportunities.

Southeastern Glacial Plains

Loss of forest cover, forest fragmentation, development, conversion to stormwater and landscape ponds, and silting in from sediment-laden runoff have altered this community and greatly reduced opportunities for management. The Northern Unit of the Kettle Moraine State Forest contains some good examples of this type. There is a need for better inventory and mapping of remaining ephemeral pond occurrences in this landscape.

Southern Lake Michigan Coastal

Loss of forest cover, forest fragmentation, conversion to stormwater and landscape ponds, silting in from sediment-laden runoff, and widespread, intensive development have altered this community. Management opportunities are limited to a few remnant, isolated forest patches. There are some opportunities to

incorporate ephemeral ponds into forest restoration efforts due to the widespread presence of loamy and clayey soils with a propensity for seasonal ponding.

Western Coulee and Ridges

Ephemeral ponds are common in the Helena Marsh and Goodwiler-Kendal Slough (Iowa County), and the Mazomanie Bottoms (Dane County) on terraces bordering the Wisconsin River and other aquatic features. Additional inventory for this type is badly needed in this Ecological Landscape.

3.3.8.9 Great Lakes Coastal Fen

3.3.8.9.1 Community Overview

This open peatland community occurs primarily along the shorelines of the Great Lakes, near the mouths of estuarine streams, as well as in association with sandspit landforms. This community is locally common along the southwestern shore of Lake Superior, because the basin is slowly subsiding due to differential isostatic rebound from the last episode of Pleistocene glaciation. This has created conditions along the Wisconsin shore that favor the development of drowned river mouths, sandspits, and extensive peatland complexes. The shore fens are generally in direct contact with clear, cold, circumneutral (pH ~7) waters of low nutrient status.

A characteristic floating sedge mat is dominated by wire-leaved graminoid plants, including woolly sedge, twig-rush, sweet gale, and buckbean. Other common herbs in the floristically diverse coastal fens of the Lake Superior region include marsh horsetail, marsh bellflower, intermediate bladderwort, lesser bladderwort, water bulrush, elliptic spikerush, narrow-leaved willow-herb, water-parsnip, and bog willow. The rare coast sedge and sooty beak-rush are locally common in some coastal fens on the Apostle Islands. The floating sedge mat is often bordered on the downslope side by a lagoon that supports marsh vegetation composed of varying mixtures of submergent, floating-leaved, and emergent species. Toward higher ground and in the shallower portions of the peatland basins, the mat is grounded. Sphagnum mosses become increasingly important and accumulate as peat, and there are significant changes in fen composition. These sphagnum-based, herbaceous peatland communities are classified as poor fen.

Coastal fens are distinguished from the more acidic open bogs and poor fens (which may adjoin them in the same wetland complex) by their scarcity or lack of Sphagnum moss species, low ericad cover, higher pH, and the presence of a direct hydrologic connection to the waters of the Great Lakes. They are distinguished from rich fens by their lower pH and the absence of "rich" peatland indicator species such as linear-leaved sundew, grass-of-parnassus, false asphodel, and beaked spikerush.

3.3.8.9.2 Vertebrate Species of Greatest Conservation Need Associated with Great Lakes Coastal Fen

Nine vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with Great Lakes coastal fens (Table 3-192).

Table 3-192. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with Great Lakes coastal fen communities.

Species Significantly Associated with Great Lakes Coastal Fens
Birds
Le Conte's Sparrow
Herptiles
Four-toed Salamander
Species Moderately Associated with Great Lakes Coastal Fens
Birds
Trumpeter Swan
Yellow Rail
Herptiles
Boreal Chorus Frog
Pickerel Frog
Mammals
Silver-haired Bat
Eastern Red Bat
Hoary Bat

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-192 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both Great Lakes coastal fens and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of Great Lakes coastal fens in each of the Ecological Landscapes (Tables 3-193 and 3-194).

- Using the analysis described above, a species was further selected if it had both a significant association with Great Lakes coastal fens and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of Great Lakes coastal fens. These species are shown in Figure 3-47.

Table 3-193. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with Great Lakes coastal fen communities and their association with Ecological Landscapes that support Great Lakes coastal fens.

Great Lakes Coastal Fen	Birds (1)*	Herptiles (1)
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Le Conte's Sparrow	Four-toed Salamander
MAJOR		
Superior Coastal Plain		
IMPORTANT		
Northern Lake Michigan Coastal		

Color Key

= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-194. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with Great Lakes coastal fen communities and their association with Ecological Landscapes that support Great Lakes coastal fens.

Great Lakes Coastal Fen	Birds (2)*		Herptiles (2)		Mammals (3)		
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Trumpeter Swan	Yellow Rail	Boreal Chorus Frog	Pickerel Frog	Silver-haired Bat	Eastern Red Bat	Hoary Bat
MAJOR							
Superior Coastal Plain							
IMPORTANT							
Northern Lake Michigan Coastal							

Color Key

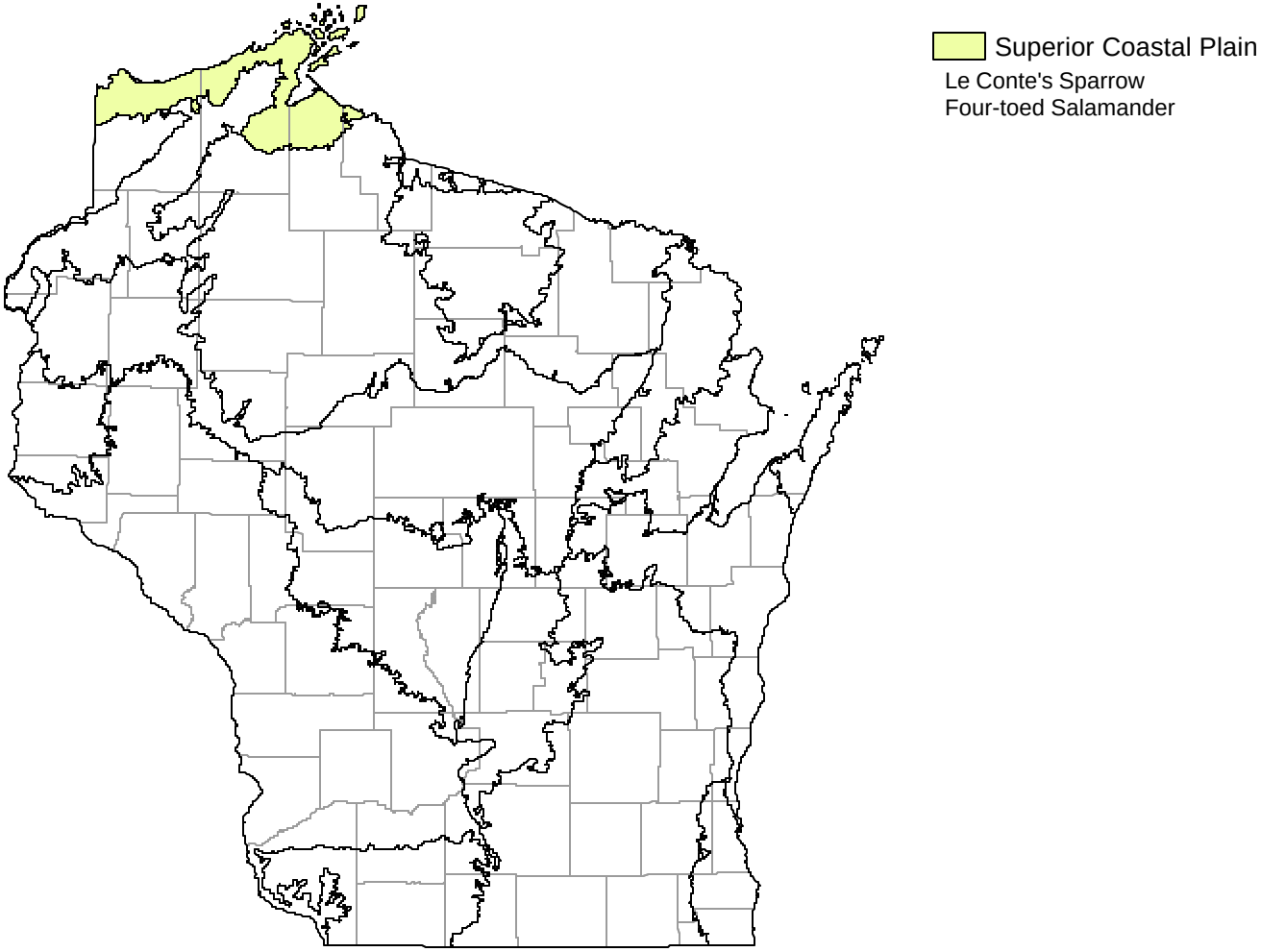
= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-47. Vertebrate Species of Greatest Conservation Needthat have *both* a significant association with Great Lakes coastal fens *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of Great Lakes coastal fens.



3.3.8.9.3 Threats and Priority Conservation Actions for Great Lakes Coastal Fens

3.3.8.9.3.1 Statewide Overview of Threats and Priority Conservation Actions for Great Lakes Coastal Fens

The following list of threats and priority conservation actions were identified for Great Lakes coastal fens in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.9.3.2 unless otherwise indicated.

Threats and Issues

- Great Lakes coastal fen is imperiled in Wisconsin, in part due to its geographic restriction and rarity of occurrence, and in part because of its great sensitivity to water quality changes.
- Dredging, filling, nutrient loading, sedimentation, and the spread of invasive species are major threats to these coastal wetlands.
- The vegetation appears to be quite sensitive to diminished water quality, especially eutrophication. Degraded wetlands that may have formerly supported wire-leaved sedge communities now support marshes composed of more tolerant plants such as cat-tails, bulrushes, bur-reeds, and arrowheads.
- Development of the sandspits that protect many of the coastal peatlands complexes can have both direct and indirect impacts.
- Loss of forest cover and reduction of conifer cover in local watersheds can lead to increased sediment load and erosion in local streams. Flood events on the streams that feed the coastal embayments supporting the peatlands can be more severe and damaging in watersheds that are not managed carefully.

Priority Conservation Actions

- Many of the most diverse and least disturbed sites are under the protective ownership of federal, state, local, and tribal governments. The development of programs to monitor community-level vegetation changes, rare species populations, the presence and abundance of invasive species, and water quality is a priority.
- Unlike coastal wetlands in many parts of the Great Lakes region, the peatlands, especially on Lake Superior, are a regionally significant repository of diversity. Invertebrate and plant surveys continue to reveal surprises that underscore the ecological importance of these peatlands.
- Additional survey work on Lake Michigan sites is needed to resolve classification issues and clarify relationships with similar peatlands elsewhere in Wisconsin and throughout the western Great Lakes region.
- Where possible, manage Great Lakes coastal fen with associated peatland communities, open water lagoons, sandspits, and upland forests.

3.3.8.9.3.2 Additional Considerations for Great Lakes Coastal Fens by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of Great Lakes coastal fen exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for Great Lakes coastal fen found in Section 3.3.8.9.3.1.

Additional Considerations for Great Lakes Coastal Fens in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

Superior Coastal Plain

Great lakes coastal fens occur with other peatland types in coastal embayments that are concentrated on the northern edge of the Bayfield Peninsula, in the Apostle Islands archipelago (Apostle Islands Sandscapes State Natural Area and Big Bay State Park (Bayfield County). There are also coastal fens at the mouths of the two largest rivers entering Lake Superior from Wisconsin: the St. Louis and the Bad.

Even the more degraded sites (e.g., parts of the St. Louis River Estuary, Douglas County) have retained attributes of high value to some wildlife species. The intact sites merit the strongest level of protection possible.

Additional Considerations for Great Lakes Coastal Fens in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

Northern Lake Michigan Coastal

Only a few fen-like peatlands occur on the Lake Michigan shore in direct contact with the waters of Lake Michigan. Toft Point State Natural Area (Door County) is one good example. More vegetation sampling is needed to define the community level affinities. However, detailed species lists obtained from several sites on the Door Peninsula have many similarities with the Lake Superior sites.

3.3.8.10 Interdunal Wetland

3.3.8.10.1 Community Overview

Interdunal wetlands occupy wind-created hollows that intersect the water table within active dune fields along the Great Lakes shores. They may also occur where moving sand encroaches on nearby wetlands, surrounding and isolating all or portions of them. The vegetation is difficult to characterize because of the small number of sites, the floristic variability that occurs (in part from the great distance between them), and the ephemeral nature of some occurrences. Plants that are at least somewhat representative of the community include twig-rush, little green sedge, Baltic rush, silverweed, pipewort, spike-rushes, ladies-tress orchids, and bladderworts.

Dune systems are rare and not well developed in Wisconsin compared to regions where the prevailing winds and nearshore currents are conducive to moving large quantities of sand around. Interdunal wetlands are known from fewer than ten locations in Wisconsin. All occurrences are small, and only one of them approaches, or slightly exceeds, ten acres. Despite their rarity and limited distribution, these wetlands provide critical habitat for many uncommon plant species, and also provide resting and feeding areas for migrating and resident waterbirds.

3.3.8.10.2 Vertebrate Species of Greatest Conservation Need Associated with Interdunal Wetlands

Two vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with interdunal wetland (Table 3-195).

Table 3-195. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with interdunal wetland communities.

Species Significantly Associated with Interdunal Wetland
Herptiles
Boreal Chorus Frog
Species Moderately Associated with Interdunal Wetland
Birds
Solitary Sandpiper

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-195 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both interdunal wetland and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of interdunal wetland in each of the Ecological Landscapes (Tables 3-196 and 3-197).

- Using the analysis described above, a species was further selected if it had both a significant association with interdunal wetland and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of interdunal wetland. These species are shown in Figure 3-48.

Table 3-196. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with interdunal wetland communities and their association with Ecological Landscapes that support interdunal wetland.

Interdunal Wetland	Herptiles (1)*
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Boreal Chorus Frog
MAJOR	
Superior Coastal Plain	
IMPORTANT	
Central Lake Michigan Coastal	
PRESENT (MINOR)	
Northern Lake Michigan Coastal	

Color Key

= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-197. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with interdunal wetland communities and their association with Ecological Landscapes that support interdunal wetland.

Interdunal Wetland Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Solitary Sandpiper Birds (1)*
MAJOR	
Superior Coastal Plain	
IMPORTANT	
Central Lake Michigan Coastal	
PRESENT (MINOR)	
Northern Lake Michigan Coastal	

Color Key

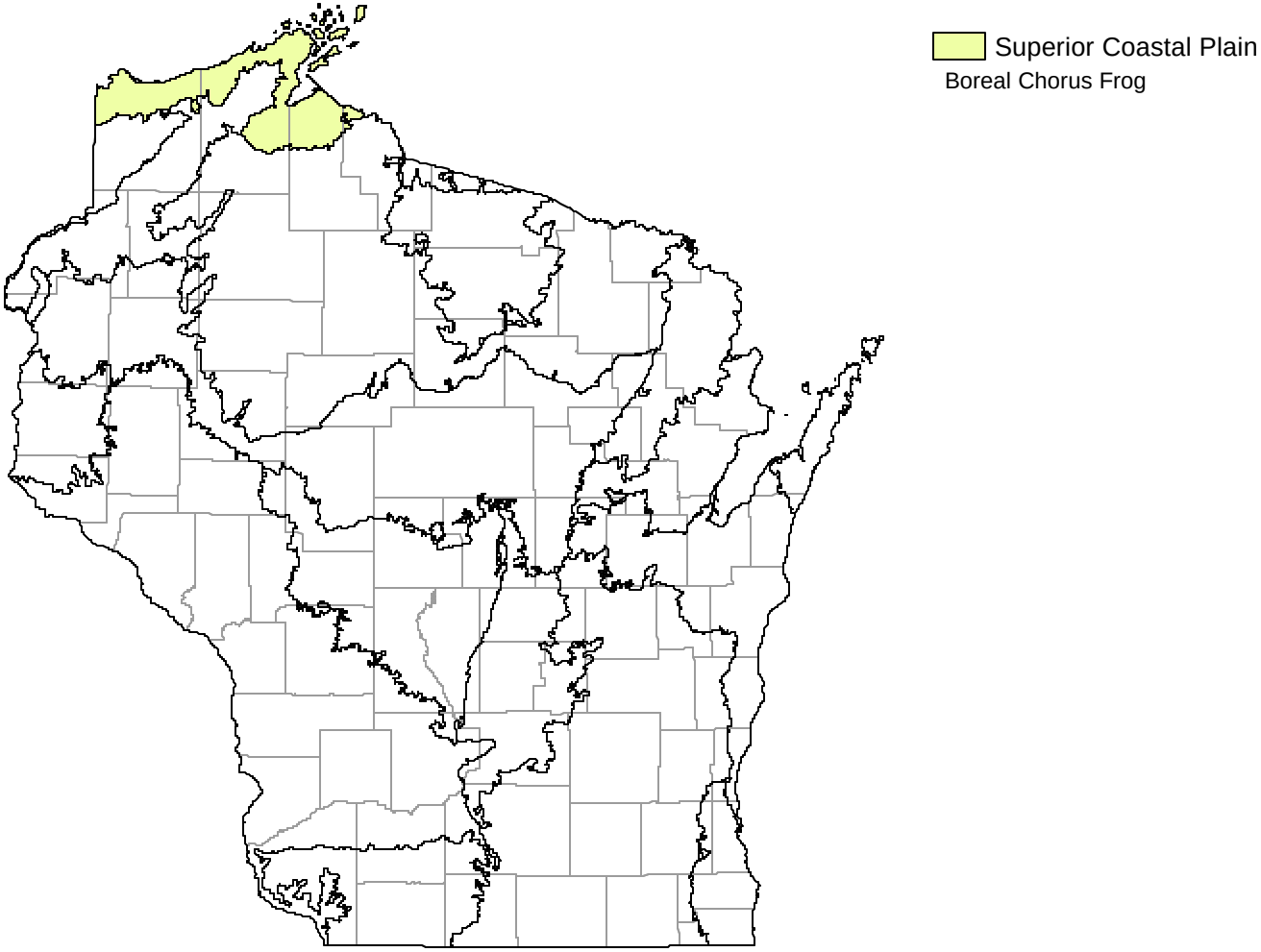
= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-48. Vertebrate Species of Greatest Conservation Need that have *both* a significant association with interdunal wetland *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of interdunal wetland.



3.3.8.10.3 Threats and Priority Conservation Actions for Interdunal Wetland

3.3.8.10.3.1 Statewide Overview of Threats and Priority Conservation Actions for Interdunal Wetland

The following list of threats and priority conservation actions were identified for interdunal wetland in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.10.3.2 unless otherwise indicated.

Threats and Issues

- Disruption of hydrology, at local and Great Lakes basin scales, is one of the greatest threats.
- Invasive plants such as purple loosestrife threaten to crowd out native species at several locations.
- Off-road vehicles, horses, or heavy foot traffic can trample sensitive vegetation and facilitate the spread of invasive species.
- Construction of jetties, seawalls, or roads can disrupt the movement of sand upon which the dune systems are ultimately dependent.

Priority Conservation Actions

- All known interdunal wetlands occur on public lands. Some of them receive a high level of protection, others would benefit from additional protective measures that would limit potentially damaging activities.
- Inform managers of the ecological significance and fragility of lake dunes. Manage these wetland communities as integral components of active dune systems whenever possible, maintaining natural shoreline processes.
- Control invasive plants as needed, including native shrubs such as speckled alder and red-osier dogwood.
- A number of rare invertebrates are known from dune environments. Expanded surveys that would include the interdunal wetlands could yield additional records of rare species.

3.3.8.10.3.2 Additional Considerations for Interdunal Wetland by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of interdunal wetland exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for interdunal wetland found in Section 3.3.8.10.3.1.

Additional Considerations for Interdunal Wetland in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

Superior Coastal Plain

All known occurrences are associated with sandscapes. Those in the Apostle Islands Archipelago are well-protected. Others, such as those at Wisconsin-Minnesota Points, are subject to intensive recreational use during the summer months and would benefit from additional protective measures as well as active efforts to control purple loosestrife and encroaching woody vegetation.

Additional Considerations for Interdunal Wetland in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

Central Lake Michigan Coastal

Though rare in this landscape, one of the state's largest interdunal wetlands occurs within Kohler-Andrae State Park (Sheboygan County).

Northern Lake Michigan Coastal

Several small but floristically rich occurrences are known from the Grand Traverse Islands off the northern Door Peninsula.

3.3.8.11 Northern Sedge Meadow

3.3.8.11.1 Community Overview

This open wetland community is dominated by sedges and grasses and occurs primarily in northern Wisconsin. There are several common, fairly distinctive, subtypes: Tussock meadow, dominated by tussock sedge and Canada bluejoint grass; Broad-leaved sedge meadow, dominated by the robust sedges (*Carex lacustris* and/or *C. utriculata*); and Wire-leaved sedge meadow, dominated by woolly sedge and/or few-seeded sedge. Frequent associates include blue flag, marsh fern, marsh bellwort, manna grasses, panicled aster, Joe-Pye weed, and the bulrushes (*Schoenoplectus tabernaemontani* and *Scirpus cyperinus*). Sphagnum mosses are either absent or they occur in scattered, discontinuous patches. Sedge meadows occur on a variety of landforms and in several ecological settings that include depressions in outwash or ground moraine landforms in which there is groundwater movement and internal drainage, on the shores of some drainage lakes, and on the margins of streams and large rivers.

3.3.8.11.2 Vertebrate Species of Greatest Conservation Need Associated with Northern Sedge Meadow

Twenty-six vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with northern sedge meadow (Table 3-198).

Table 3-198. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with northern sedge meadow communities.

Species Significantly Associated with Northern Sedge Meadow
Birds
American Bittern
Northern Harrier
Yellow Rail
Wilson's Phalarope
Le Conte's Sparrow
Nelson's Sharp-tailed Sparrow
Bobolink
Herptiles
Boreal Chorus Frog
Pickerel Frog
Mink Frog
Butler's Garter Snake
Species Moderately Associated with Northern Sedge Meadow
Birds
American Black Duck
Blue-winged Teal
Greater Prairie-chicken
Sharp-tailed Grouse
Whooping Crane
Black Tern
Short-eared Owl
Herptiles
Four-toed Salamander
Wood Turtle
Blanding's Turtle
Mammals
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat
Moose

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-198 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both northern sedge meadow and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of northern sedge meadow in each of the Ecological Landscapes (Tables 3-199 and 3-200).

- Using the analysis described above, a species was further selected if it had both a significant association with northern sedge meadow and a high probability of occurring in an Ecological

Landscape(s) that represents a major opportunity for protection, restoration and/or management of northern sedge meadow. These species are shown in Figure 3-49.

Table 3-199. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with northern sedge meadow communities and their association with Ecological Landscapes that support northern sedge meadow.

Northern Sedge Meadow

Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Birds (7)*							Herptiles (4)			
	American Bittern	Northern Harrier	Yellow Rail	Wilson's Phalarope	Le Conte's Sparrow	Nelson's Sharp-tailed Sparrow	Bobolink	Boreal Chorus Frog	Pickerel Frog	Mink Frog	Butler's Garter Snake
MAJOR											
Central Sand Plains	H	H	M	M	M		H		M		
North Central Forest	H	H					M	H	M	H	
Northern Highland	M	M	M			M				H	
Northern Lake Michigan Coastal	M	H	M				H		M	H	
Northwest Lowlands	H	H			H		M	H	M	H	
Northwest Sands	H	H	H	M	H	H	H	H	M	M	
IMPORTANT											
Central Lake Michigan Coastal	M	H		M			H		M		M
Central Sand Hills	H	H	M		M		H		M		
Forest Transition	H	H	M		M		H		M		
Northeast Sands	M	M					H		M	H	
Southeast Glacial Plains	H	H		M			H		H		H
Superior Coastal Plain	H	H	M		H		H	H	M	H	
Western Coulee and Ridges		H					H		H		
PRESENT (MINOR)											
Western Prairie	M	H			M		H		M		

Color Key

- H = **HIGH probability the species occurs in this Ecological Landscape**
- M = **MODERATE probability the species occurs in this Ecological Landscape**
- = **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

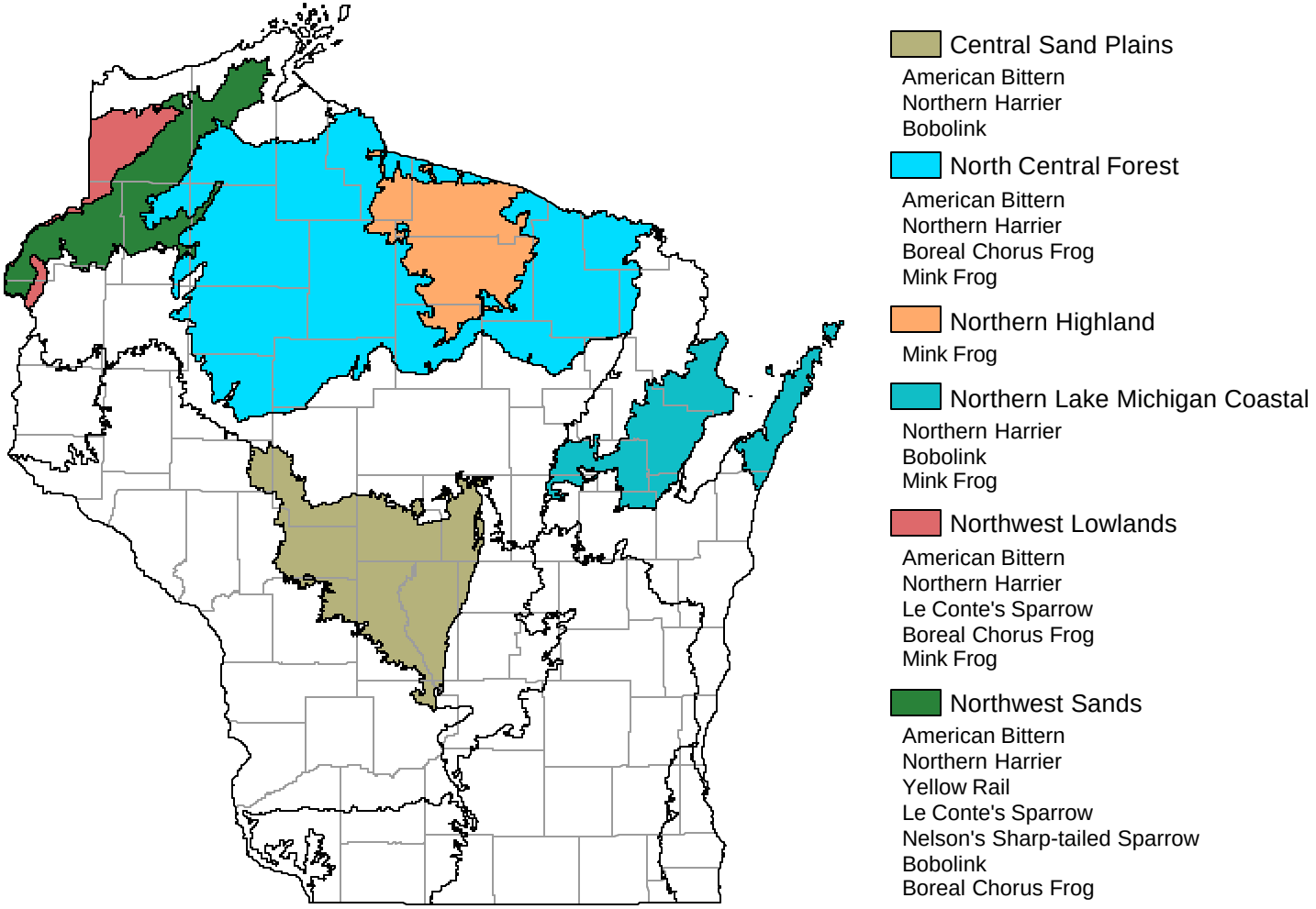
Table 3-200. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with northern sedge meadow communities and their association with Ecological Landscapes that support northern sedge meadow.

Northern Sedge Meadow	Birds (7)*							Herptiles (3)			Mammals (5)				
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	American Black Duck	Blue-winged Teal	Greater Prairie-Chicken	Sharp-tailed Grouse	Whooping Crane	Black Tern	Short-eared Owl	Four-toed Salamander	Wood Turtle	Blanding's Turtle	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat	Moose
MAJOR															
Central Sand Plains		H	H	M	H	H	H	H	H	H	M	M	M	M	
North Central Forest				M		M		H	H		M	H	M	H	M
Northern Highland		M				H		H	H				M		M
Northern Lake Michigan Coastal		H				H		M	H	M	M	M	M	M	
Northwest Lowlands		M				M		H	H		M	M	M	M	M
Northwest Sands		H		H		H		M	H	H					
IMPORTANT															
Central Lake Michigan Coastal		H				H	M	H	M	M	M	M	M	M	
Central Sand Hills		H			H	H	M	M		H	M	M	M	M	
Forest Transition		H	H			H		H	H		M	M	H	M	
Northeast Sands				M				M	H	M					
Southeast Glacial Plains		H			H	H	H	H		H	M	M	M	M	
Superior Coastal Plain		H		M		H		H	H		M	M	M	M	M
Western Coulee and Ridges		H			M	M	M	H	H	H	H	M	M	M	
PRESENT (MINOR)															
Western Prairie		H				M	M		H	H					

Color Key
H = HIGH probability the species occurs in this Ecological Landscape
M = MODERATE probability the species occurs in this Ecological Landscape
= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-49. Vertebrate Species of Greatest Conservation Need that have *both* a significant association with northern sedge meadow *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of northern sedge meadow.



3.3.8.11.3 Threats and Priority Conservation Actions for Northern Sedge Meadow

3.3.8.11.3.1 Statewide Overview of Threats and Priority Conservation Actions for Northern Sedge Meadow

The following list of threats and priority conservation actions were identified for northern sedge meadow in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.11.3.2 unless otherwise indicated.

Threats and Issues

- Changing hydrology by raising or lowering water levels can be detrimental.
- Road construction can alter hydrology and also become detrimental to this community type.
- Woody invasion is a problem that is usually associated with attempted drainage, sometimes combined with the lack of fire.
- Invasive species problems exist in some Ecological Landscapes, at specific locations, especially from reed canary grass, purple loosestrife, and giant reed. Disturbance can create opportunities for establishment or proliferation of these invasive species.
- Conversion of sedge meadow to other habitats such as open emergent marsh, and agricultural uses via drainage, has been a problem in some areas.

Priority Conservation Actions

- Maintain large blocks of habitat; manage complexes of sedge meadow in conjunction with associated wetlands such as open bog, poor fen, emergent marsh, shrub-carr, alder thicket and northern wet forest where possible.
- Keep open aspect by using prescribed fire and/or fluctuating water levels where appropriate and as needed to prevent woody species invasion.
- Manage adjacent uplands in appropriate Ecological Landscapes and on appropriate sites for open habitats such as pine barrens, sand prairie, or surrogate grasslands.
- Buffer uplands and manage shorelines to prevent erosion and sedimentation, and limit pollutant inputs.
- Manage watersheds to control runoff from surrounding agricultural or residential areas that may contribute nutrients and sediment.
- Avoid disturbance to soils (e.g., pothole creation, or construction of level ditches) within this type to limit establishment potential of invasives.
- Follow existing WDNR management guidelines for wet grasslands to minimize impacts to sensitive species.
- Develop educational tools and demonstration areas that promote benefits of prescribed fire, and address liability concerns.
- Maintain hydrologic processes by preventing drainage or permanent flooding.
- Maintain natural cycles of fluctuating water levels; conduct additional studies as needed to determine appropriate cycles for a given location.
- Monitor sedge meadows to determine whether management (whether active or passive) is maintaining native diversity.
- Continue and support research to find biocontrols for invasives; control invasives on a site-by-site basis using the most appropriate methods.
- Study the role of beaver, especially in some of the northern Ecological Landscapes, in maintaining (or inundating) sedge meadows in certain landscape situations (e.g., along the upper reaches of headwaters streams).
- More sampling and analysis is needed to document the variability of the "northern" meadows and refine the community level classification of the types.

3.3.8.11.3.2 Additional Considerations for Northern Sedge Meadow by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of northern sedge meadow exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for northern sedge meadow found in Section 3.3.8.11.3.1.

Additional Considerations for Northern Sedge Meadow in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

Central Sand Plains

Large blocks of open wetland and upland habitat should be maintained where possible; this Ecological Landscape has the potential to accommodate the design of very large management complexes of sedge meadow in conjunction with other open peatlands such as open bogs, poor fens, and muskeg. Hydrologic alterations have been pervasive in this Ecological Landscape and long-term impacts to all wetlands need to be better understood. The commercial harvest of sphagnum moss has occurred in most of the larger and many of the smaller wetland basins. The community level impacts are poorly understood, but this activity has created what might be termed "surrogate sedge meadows", following removal of the living sphagnum. The timing of moss harvest can conflict with the nesting season of wetland birds, including Species of Greatest Conservation Need such as American bittern and northern harrier.

Large, though somewhat altered examples can be found on a number of public and private ownerships in this Ecological Landscape. Examples include Wood County State Wildlife Area, Sandhill State Wildlife Area (Wood County), and Meadow Valley Wildlife Area (Juneau County).

North Central Forest

Large open wetlands are not common in this Ecological Landscape, but there are many small to medium sized sedge meadows in basins, along streams, and on lakeshores. Large blocks of habitat should be maintained where possible and managed in conjunction with other wetland types. Good examples occur within the Chequamegon-Nicolet National Forest, and also on many of the county forests in this Ecological Landscape.

Northern Highland

In this Ecological Landscape, sedge meadow habitats are associated with the shorelines of drainage lakes, the margins of rivers, or the edges of spring ponds. Good examples occur on the Northern Highland-American Legion State Forest, in Vilas, Iron, and Oneida counties.

Northern Lake Michigan Coastal

Drainage for agriculture or residential development is still a problem in some areas. Serious problems exist in meadows on the west shore of Green Bay due to invasives such as giant reed, reed canary grass, and purple loosestrife.

Significant occurrences are present at Kangaroo Lake and the Mink River on the Door Peninsula, and at locations along the west shore of Green Bay such as Peshtigo Harbor State Wildlife Area in Marinette County.

Northwest Lowlands

Management should occur within the context of large wetlands complexes that include other peatlands communities, shrub swamps, stream corridors, and lake shores. Beaver impacts should be determined and populations should be maintained at appropriate levels to ensure that sedge meadows and other wetlands are not adversely impacted at a broad scale. Invasives are not a large problem at present, but should be monitored. Occurrences of northern sedge meadow are present along some of the streams in this Ecological Landscape.

Northwest Sands

Impoundment construction has converted sedge meadow habitat to open marsh in some areas. Excessive conversion of meadows should be avoided in order to maintain regional diversity for species and communities. Locally, sedimentation from agriculture can be a problem. Some problems exist from invasives such as reed canary grass and purple loosestrife. Outstanding examples occur at Fish Lake State Wildlife Area and Crex Meadows State Wildlife Area, both in Burnett County.

Additional Considerations for Northern Sedge Meadow in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

Central Lake Michigan Coastal

This Ecological Landscape is heavily developed and contains very little public land. Northern sedge meadow occurs on the east side of the Wolf River south of Shawano at Navarino State Wildlife Area (Shawano County), and Point Beach State Forest (Manitowoc County).

Central Sand Hills

Good examples of this sedge meadow community exist at Germania Marsh State Wildlife Area (Marquette County) and on several private tracts.

Forest Transition

Serious problems exist from invasives such as reed canary grass and purple loosestrife in parts of this Ecological Landscape. In this Ecological Landscape, there is the potential to manage very large complexes of sedge meadow in conjunction with surrogate prairie grasslands. Examples occur at Mead State Wildlife Area (Marathon County) and Myklebust Lake State Natural Area (Waupaca County).

Northeast Sands

Drainage for agriculture was a problem locally in the past. Good occurrences are still present on portions of the Menominee Reservation.

Southeast Glacial Plains

The type is uncommon in this Ecological Landscape, but several significant occurrences of large size and unusual species composition exist in the northernmost portions. Agricultural and residential developments are highly significant in this landscape. Ditching, agricultural runoff, and invasive plants are all problems here. The best occurrences are currently privately-owned.

Superior Coastal Plain

Past land use practices (failed attempts at agriculture) have altered hydrology in the poorly drained red clay soils and created meadows with unusual composition. Prescribed fire could be an important management tool here. Good examples of northern sedge meadow occur at the Pokegama-Carnegie Wetlands (Douglas County), at the mouth of the Sand River (Bayfield County), and in some of the peatland complexes in Ashland County.

Western Coulees and Ridges

This type is restricted to a few locations in the northern portions of the Ecological Landscape. Most sites are privately owned.

3.3.8.12 Open Bog

3.3.8.12.1 Community Overview

Bogs are acidic, low nutrient, northern Wisconsin peatlands dominated by sphagnum mosses that occur in deep layers and accumulate over time as peat. The bog surface is often uneven, with pronounced hummock and hollow microtopography. In northern Wisconsin, bogs are frequently found in the kettle depressions of pitted outwash and morainal landforms. They also frequently occur on the borders of lakes that have low nutrient inputs. Vascular plant diversity is very low in the most acidic sites, but includes characteristic and distinctive specialists such as the narrow-leaved sedge species, cotton-grasses, and ericaceous shrubs, especially leatherleaf, bog laurel, bog rosemary, and small cranberry. Trees are absent or stunted and achieve very low cover values.

In the strictest sense, bogs receive nutrients only from precipitation and limited internal runoff. The thick layers of sphagnum isolate the bog from the influence of nutrient enriched groundwater, and create an environment characterized by high acidity, low oxygen and nutrient levels, and inhabited by a limited number of highly specialized plants that are able to tolerate or thrive in the extreme conditions. Poor fen, open bog, and muskeg often occupy different parts of the same wetland basin, which may include one or more types of lowland coniferous forest as well. Each of these communities responds to slight differences in local site conditions.

3.3.8.12.2 Vertebrate Species of Greatest Conservation Need Associated with Open Bog

Twenty-six vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with open bog (Table 3-201).

Table 3-201. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with open bog communities.

Species Significantly Associated with Open Bog
Birds
American Bittern
Yellow Rail
Herptiles
Four-toed Salamander
Boreal Chorus Frog
Mink Frog
Northern Ribbon Snake
Eastern Massasauga Rattlesnake
Species Moderately Associated with Open Bog
Birds
American Black Duck
Northern Harrier
Spruce Grouse
Whooping Crane
Solitary Sandpiper
Olive-sided Flycatcher
Golden-winged Warbler
Connecticut Warbler
Henslow's Sparrow
Le Conte's Sparrow
Bobolink
Rusty Blackbird
Herptiles
Pickerel Frog
Mammals
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat
Gray Wolf
Moose

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-201 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both open bog and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of open bog in each of the Ecological Landscapes (Tables 3-202 and 3-203).

- Using the analysis described above, a species was further selected if it had both a significant association with open bog and a high probability of occurring in an Ecological Landscape(s) that

represents a major opportunity for protection, restoration and/or management of open bog. These species are shown in Figure 3-50.

Table 3-202. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with open bog communities and their association with Ecological Landscapes that support open bog.

Open Bog	Birds (2)*		Herptiles (5)				
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	American Bittern	Yellow Rail	Four-toed Salamander	Boreal Chorus Frog	Mink Frog	Northern Ribbon Snake	Eastern Massasauga Rattlesnake
MAJOR							
Central Sand Plains							
North Central Forest							
Northern Highland							
Northwest Lowlands							
Northwest Sands							
Superior Coastal Plain							
IMPORTANT							
Central Sand Hills							
Forest Transition							
Northeast Sands							
PRESENT (MINOR)							
Central Lake Michigan Coastal							
Northern Lake Michigan Coastal							

Color Key

= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-203. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with open bog communities and the ir association with Ecological Landscapes that support open bog.

Open Bog

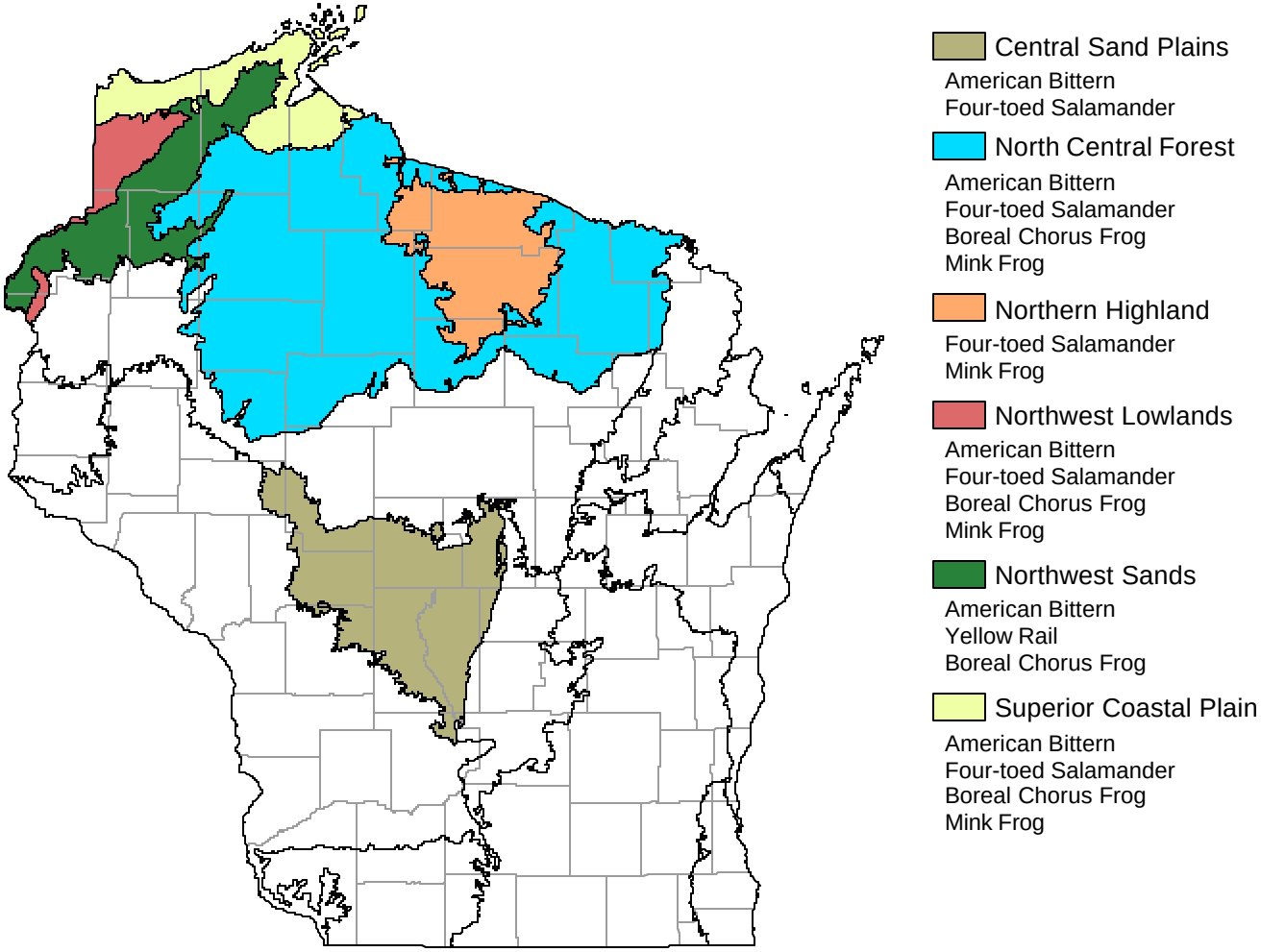
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Birds (12)*												Herptiles (1)	Mammals (6)					
	American Black Duck	Northern Harrier	Spruce Grouse	Whooping Crane	Solitary Sandpiper	Olive-sided Flycatcher	Golden-winged Warbler	Connecticut Warbler	Henslow's Sparrow	Le Conte's Sparrow	Bobolink	Rusty Blackbird	Pickerel Frog	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat	Gray Wolf	Moose
MAJOR																			
Central Sand Plains		H		H	M		H	M	H	M	H	M	M	M	M	M	M	H	
North Central Forest		H	H		M	H	H	M			M	M	M	M	H	M	H	H	M
Northern Highland		M	H		M	H	H	H				M				M		H	M
Northwest Lowlands		H			M	H	H	H		H	M	M	M	M	M	M	M	H	M
Northwest Sands		H			M	M	H	H		H	H	M	M					H	
Superior Coastal Plain		H			M	M	H			H	H	M	M	M	M	M	M	H	M
IMPORTANT																			
Central Sand Hills		H		H	M		M		H	M	H	M	M	M	M	M	M	M	
Forest Transition		H			M		H		M	M	H	M	M	M	M	H	M	M	
Northeast Sands		M			M		H				H	M	M					M	
PRESENT (MINOR)																			
Central Lake Michigan Coastal		H			M		M		M		H	M	M	M	M	M	M		
Northern Lake Michigan Coastal		H			M	H	M		M		H	M	M	M	M	M	M	M	

Color Key

- H = **HIGH probability the species occurs in this Ecological Landscape**
- M = **MODERATE probability the species occurs in this Ecological Landscape**
- = **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-50. Vertebrate Species of Greatest Conservation Need that have *both* a significant association with open bog *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of open bog.



3.3.8.12.3 Threats and Priority Conservation Actions for Open Bog

3.3.8.12.3.1 Statewide Overview of Threats and Priority Conservation Actions for Open Bog

The following list of threats and priority conservation actions were identified for open bog in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.12.3.2 unless otherwise indicated.

Threats and Issues

- Changing hydrology by raising or lowering water levels can be detrimental. Nutrient loading, especially when accompanied by hydrologic modifications such as drainage, can totally change the essential character of the community.
- The construction of dams, including beaver dams, may contribute to flooding as well as to the conversion of open bog to marsh habitat, although in some situations (e.g., on a lake shore) the bog mat can float and, within limits, may escape inundation due to a local rise in water level.
- Woody invasion is a problem associated with hydrologic disturbances such as ditching or cutting off the source of water (e.g., by road construction).
- Some problems exist from invasion of nonnative, invasive plants such as purple loosestrife and common reed. Disturbance allows invasive species an opportunity to flourish and should be avoided when possible.
- Motorized recreation in this community contributes to detrimental changes and facilitates the spread of invasive plants.
- Recovery of bog vegetation from damage can be extremely slow.
- Commercial industries such as cranberry growing, 'wild' rice farming, and peat harvesting can impact this community negatively.
- The filling of wetlands associated with residential or other development can permanently damage or destroy an open bog.

Priority Conservation Actions

- Maintain large blocks and the quality of other wetlands surrounding or adjoining this community. Manage as complexes of co-occurring peatland communities. Buffer with open habitats on adjacent uplands in appropriate landscapes (e.g., in the Northwest Sands Ecological Landscape).
- Use limited prescribed fire and mechanical treatments to prevent woody invasion as needed.
- Maintain natural hydrologic processes by preventing drainage or flooding.
- Monitor and control invasive species.
- Manage and monitor recreational uses so that they do not harm the environment and cause adverse impacts (i.e., erosion, spread of invasive species, habitat loss).
- Use Best Management Practices and sustainable forest management practices in and around bogs and other peatland habitats.

3.3.8.12.3.2 Additional Considerations for Open Bog by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of open bog exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for open bog found in Section 3.3.8.12.3.1.

Additional Considerations for Open Bog in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

Central Sand Plains

Hydrologic changes due to drainage, dike construction, residential development, commercial cranberry operations, and road building have all impacted this community type. The Dewey Marsh in Portage County contains extensive tracts of open bog, poor fen and muskeg within a large, diverse wetland complex on managed and partially protected public land. Other examples of bog habitats occur on the Black River State Forest (Jackson County) and Meadow Valley Wildlife Area (Juneau County).

North Central Forest

Boggy habitats are widespread and common in this Ecological Landscape, usually associated with other wetland types. Increased pressure from motorized recreation is causing some impact (i.e., spread of invasive species such as purple loosestrife and phragmites).

Northern Highland

There is extensive representation of this community type in this Ecological Landscape, with numerous small and large open bogs and muskegs. The Powell Marsh and the vast peatlands along the Manitowish River (Vilas and Oneida counties), and Thunder Marsh in Oneida County contain good representatives of this and related communities. These three areas are found mostly on public land. Road density in this Ecological Landscape is higher per square mile than in other northern Ecological Landscapes, and has impacted hydrology in several locations. Development adjacent to this community is causing some impacts to hydrology due to wetland filling and road construction. Commercial cranberry operations have altered some of this community. Increased pressure from motorized recreation is causing some impact (i.e., spread of invasive species such as purple loosestrife and phragmites). Best Management Practices and sustainable forest management adjacent to this community should be used.

Northwest Lowlands

The open bog complexes are large within this Ecological Landscape. Human populations and road densities are lower within this Ecological Landscape than many other places and have less impacts to this community type. Black Lake Bog, and the Empire and Belden Swamps (all in Douglas County) contain extensive bogs within large wetland complexes that are intact and well preserved. Increased pressure from motorized recreation is causing some impact (i.e., spread of invasive species such as purple loosestrife and phragmites).

Northwest Sands

This type is commonly found in the kettle depressions of pitted outwash landforms, often associated with lakes. Human populations and road densities are low but increasing in this Ecological Landscape, especially in the lake districts. Some small but high quality open bogs and poor fens exist and are now protected on the Brule River State Forest. There are some excellent kettle bogs in the Chequamegon-Nicolet National Forest (Douglas and Bayfield Counties).

Superior Coastal Plain

A complex ecosystem of open bog (though somewhat limited in size) within a wetland matrix of other peatland communities exists within the Apostle Islands archipelago. Some of this community in the

archipelago is preserved in the National and State Park system and is being affected adversely by recreational uses.

On the mainland, the Kakagon Sloughs on the Bad River Indian Reservation maintains smaller portions of an intricate open bog community in relation to the many quality wetland community types in the area. Though somewhat isolated from other open bog communities, it is well preserved. Sultz Swamp (Bayfield County) is one of the largest acid peatlands (with minimal disturbance) in the Lake Superior basin that contains an open bog community as part of the wetland complex. Though invasive plants may not be a serious problem for this type at the present time, there are scattered invasions of purple loosestrife, phragmites and reed canary grass. These invasives are usually present in areas that have been disturbed in some way.

Additional Considerations for Open Bog in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

Central Sand Hills

Hydrologic changes due to residential development and road building are an issue. Agricultural practices adjacent to this community can result in soil erosion and water quality degradation due to sedimentation and nutrient loading.

Forest Transition

Smaller open bogs associated with lakes are common. Residential and agricultural developments are concerns, as is habitat fragmentation. The community has been affected by changing site hydrology, wetland filling, and type conversion.

Northeast Sands

This community type is usually found in association with smaller lakes in this Ecological Landscape. Population and road density are lower within this Ecological Landscape resulting in fewer impacts to this community. However, motorized recreation is on the increase and may enhance the spread of invasive species such as purple loosestrife. Best Management Practices and sustainable forest management should be used near this community.

3.3.8.13 Shrub-carr

3.3.8.13.1 Community Overview

This wetland community is dominated by tall shrubs such as red-osier dogwood, silky dogwood, meadowsweet, and various willows. Canada bluejoint grass is often very common. Associates are similar to those found in alder thickets and tussock-type sedge meadows. This type occupies areas that are transitional between open wetlands such as wet prairie, calcareous fen, or southern sedge meadow, and forested wetlands such as floodplain forest or southern hardwood swamp. Shrub-carr can persist at a given site for a very long time if natural hydrologic cycles are maintained. This type often occurs in bands around lakes or ponds, on the margins of river floodplains, or, more extensively, in glacial lakebeds. It is common and widespread in southern Wisconsin but also occurs in the north. In the south, shrub-carr was often an integral part of prairie-savanna landscapes, though it also occurred in wetlands within more forested regions. In the north, the landscape matrix around the shrub-carr type was usually upland forest. Statewide, shrub-carr remains quite common, and has fared considerably better than many of the other native wetland types within its range.

Past drainage and marsh hay mowing likely had a negative effect on shrub-carr, whereas clearing of conifer swamps likely produced more of this habitat. Once fire was controlled and hay mowing was discontinued in lowland meadows, shrub-carr likely increased in extent. Drainage of meadows and marshes has also allowed shrub-carr habitats to increase in some areas. As a result of wetland drainage and fire suppression, shrub-carr now occupies many sites that formerly supported much more extensive marsh, wet meadow, prairie, and fen vegetation, and therefore, it is sometimes targeted for elimination. However, it is an important native wetland type that has its place on our landscape and should be protected, managed, and restored at appropriate locations.

3.3.8.13.2 Vertebrate Species of Greatest Conservation Need Associated with Shrub-Carr

Twenty-seven vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with shrub-carr (Table 3-204).

Table 3-204. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with shrub-carr communities.

Species Significantly Associated with Shrub-Carr
Birds
American Woodcock
Black-billed Cuckoo
Willow Flycatcher
Veery
Golden-winged Warbler
Herptiles
Four-toed Salamander
Wood Turtle
Queen Snake
Butler's Garter Snake
Western Ribbon Snake
Eastern Massasauga Rattlesnake
Mammals
Moose
Species Moderately Associated with Shrub-Carr
Birds
Yellow-crowned Night Heron
Yellow-billed Cuckoo
Short-eared Owl
Bell's Vireo
Blue-winged Warbler
Rusty Blackbird
Herptiles
Pickerel Frog
Mink Frog
Blanding's Turtle
Northern Ribbon Snake
Mammals
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat
Gray Wolf

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-204 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both shrub-carr and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of shrub-carr in each of the Ecological Landscapes (Tables 3-205 and 3-206).

- Using the analysis described above, a species was further selected if it had both a significant association with shrub-carr and a high probability of occurring in an Ecological Landscape(s) that

represents a major opportunity for protection, restoration and/or management of shrub-carr. These species are shown in Figure 3-51.

Table 3-205. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with shrub-carr communities and their association with Ecological Landscapes that support shrub-carr.

Shrub Carr	Birds (5)*					Herptiles (6)						Mammals (1)
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	American Woodcock	Black-billed Cuckoo	Willow Flycatcher	Veery	Golden-winged Warbler	Four-toed Salamander	Wood Turtle	Queen Snake	Butler's Garter Snake	Western Ribbon Snake	Eastern Massasauga Rattlesnake	Moose
MAJOR												
Central Sand Hills	■	■	■	■	■	■						
Central Sand Plains	■	■	■	■	■	■	■				■	
Northern Lake Michigan Coastal	■	■	■	■	■	■	■					
Southeast Glacial Plains	■	■	■	■	■	■		■	■		■	
Western Coulee and Ridges	■	■	■	■		■	■				■	
IMPORTANT												
Central Lake Michigan Coastal	■	■	■	■	■	■	■		■			
Forest Transition	■	■		■	■	■	■					
North Central Forest	■	■		■	■	■	■					■
Northern Highland	■			■	■	■	■					■
Southern Lake Michigan Coastal	■	■	■					■	■		■	
Superior Coastal Plain	■	■		■	■	■	■					■
PRESENT (MINOR)												
Northeast Sands	■	■		■	■	■	■					
Northwest Lowlands	■	■		■	■	■	■					■
Northwest Sands	■	■		■	■	■	■					
Southwest Savanna		■	■									
Western Prairie	■		■	■			■					

Color Key

■ = **HIGH probability the species occurs in this Ecological Landscape**

■ = **MODERATE probability the species occurs in this Ecological Landscape**

□ = **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-206. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with shrub-carr communities and their association with Ecological Landscapes that support shrub-carr.

Shrub Carr	Birds (6)*						Herptiles (4)				Mammals (5)				
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Yellow-crowned Night-Heron	Yellow-billed Cuckoo	Short-eared Owl	Bell's Vireo	Blue-winged Warbler	Rusty Blackbird	Pickerel Frog	Mink Frog	Blanding's Turtle	Northern Ribbon Snake	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat	Gray Wolf
MAJOR															
Central Sand Hills		H	M		H	M	M		H		M	M	M	M	M
Central Sand Plains		H	H		H	M	M		H		M	M	M	M	H
Northern Lake Michigan Coastal		M			M	M	M	H	M		M	M	M	M	M
Southeast Glacial Plains	M	H	H	M	H	H	H		H	H	M	M	M	M	
Western Coulee and Ridges	H	H	M	H	H	H	H		H		H	M	M	M	
IMPORTANT															
Central Lake Michigan Coastal	M	M	M		M	M	M		M	H	M	M	M	M	
Forest Transition		M			M	M	M				M	M	H	M	M
North Central Forest						M	M	H			M	H	M	H	H
Northern Highland						M		H					M		H
Southern Lake Michigan Coastal	M	M	M	M	M	M			H						
Superior Coastal Plain						M	M	H			M	M	M	M	H
PRESENT (MINOR)															
Northeast Sands						M	M	H	M						M
Northwest Lowlands						M	M	H			M	M	M	M	H
Northwest Sands					M	M	M	M	H						H
Southwest Savanna		M	H	H	M	M	H		H		M		M		
Western Prairie			M		H	M	M		H						

Color Key

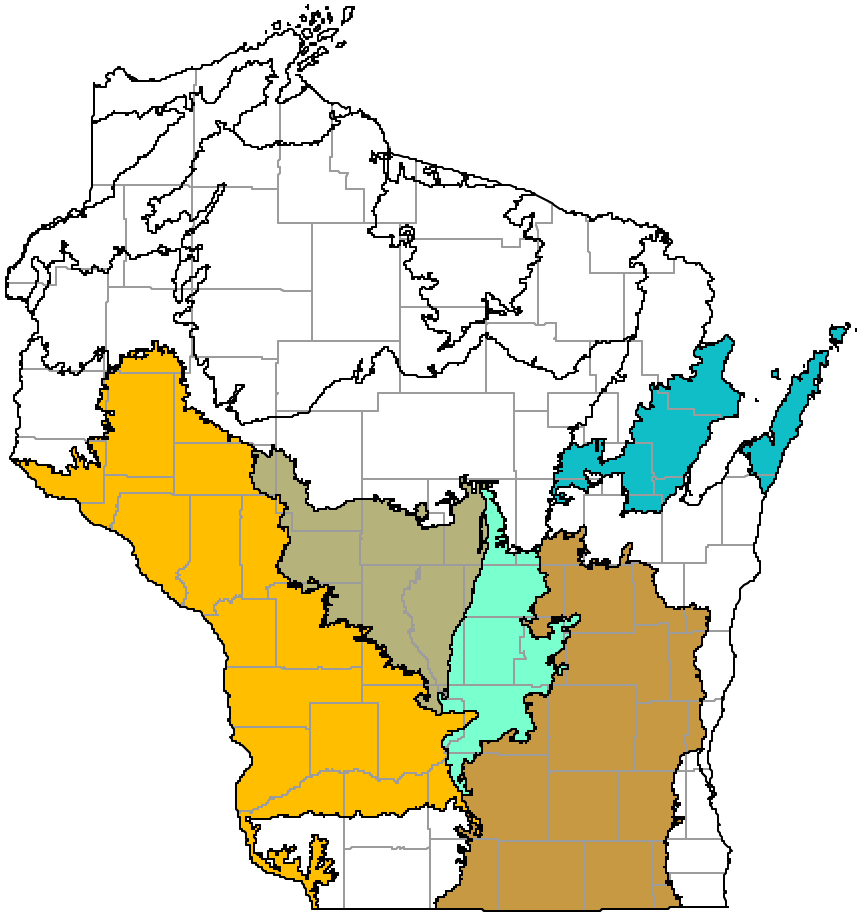
H = **HIGH probability the species occurs in this Ecological Landscape**

M = **MODERATE probability the species occurs in this Ecological Landscape**

= **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-51. Vertebrate Species of Greatest Conservation Need that have *both* a significant association with shrub-carr *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of shrub-carr.



Central Sand Hills
American Woodcock
Black-billed Cuckoo
Willow Flycatcher
Veery

Central Sand Plains
American Woodcock
Black-billed Cuckoo
Willow Flycatcher
Veery
Golden-winged Warbler
Four-toed Salamander
Wood Turtle

Northern Lake Michigan Coastal
American Woodcock
Black-billed Cuckoo
Willow Flycatcher
Veery
Wood Turtle

Southeast Glacial Plains
American Woodcock
Black-billed Cuckoo
Willow Flycatcher
Four-toed Salamander
Queen Snake
Butler's Garter Snake
Eastern Massasauga Rattlesnake

Western Coulees and Ridges
American Woodcock
Black-billed Cuckoo
Willow Flycatcher
Veery
Four-toed Salamander
Wood Turtle
Eastern Massasauga Rattlesnake

3.3.8.13.3 Threats and Priority Conservation Actions for Shrub-Carr

3.3.8.13.3.1 Statewide Overview of Threats and Priority Conservation Actions for Shrub-Carr

The following list of threats and priority conservation actions were identified for shrub-carr in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.13.3.2 unless otherwise indicated.

Threats and Issues

- Invasive exotic plants are a problem, especially reed canary grass and glossy buckthorn. Both of these species can out-compete native species.
- Altered hydrology, caused by lowering or raising water levels from road construction, residential development, agricultural drainage, beaver activity, or impoundment creation for flowages, can be detrimental to this type.
- Sedimentation and pollution from surrounding agricultural areas can lead to changes in plant composition and encourage invasive plants.
- Grazing often leads to the increase of or conversion to a reed canary grass-dominated monotypic understory.

Priority Conservation Actions

- Maintain or restore existing degraded sites of this community type. Key management factors are the protection of site hydrology and control of invasive plants.
- Entire river corridors and lacustrine depressions should be protected and sustained along a vegetational gradient from open water to various lowland communities, into uplands.
- Control runoff from surrounding agricultural areas that may contribute nutrients and sediments, which can reduce habitat suitability for native plants and animals and benefit invasives.
- Use buffers within floodplains to prevent sedimentation and limit nonpoint pollution.
- Limit grazing to prevent conversion to a reed canary grass understory.
- Maintain beaver populations at appropriate levels.
- Obtain more information on how to manage this community type, and the wetland mosaic of which it is usually a component.
- The practice of creating impoundments to benefit waterfowl can conflict with the protection of other wetland types, including shrub-carr. Landscape level assessments of conservation need and representation of the native communities occurring within protected areas would help.
- Additional work is needed on the sampling and classification of lowland shrub communities, especially in the northern part of the state. In some areas (e.g., western part of the Superior Coastal Plain Ecological Landscape), alder and willows co-occur and often appear to be co-dominant. In other areas, tall shrub communities consist of bog birch, winterberry holly, and viburnums, rather than speckled alder, or combinations of willows and dogwoods. In the south, sloughs and oxbow lakes associated with large floodplain systems are sometimes bordered by extensive thickets of buttonbush.

3.3.8.13.3.2 Additional Considerations for Shrub-Carr by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of shrub-carr exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for shrub-carr found in Section 3.3.8.13.3.1.

Additional Considerations for Shrub-Carr in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management of Shrub-carr

Central Sand Hills

Examples of shrub-carr can be found at the Germania Marsh State Wildlife Area, Lawrence Creek State Wildlife Area, and Harris Marsh in Marquette County. Beaver populations should be maintained at an appropriate level in this Ecological Landscape to prevent conversion of shrub-carr communities.

Central Sand Plains

Examples of this community type can be found at Quincy Bluff and Wetlands State Natural Area, Colburn State Wildlife Area, Meadow Valley State Wildlife Area, and many additional locations on other public lands. In this Ecological Landscape there is the potential to manage this community type in very large wetland complexes with northern sedge meadow, open bog, poor fen, alder thicket, and tamarack swamp. Beaver populations should be maintained at an appropriate level in this Ecological Landscape to prevent conversion of shrub-carr communities. Hydrologic alterations are pervasive in this landscape, especially ditching and impoundment construction. More care needs to be taken to ensure that many good examples of this and other native wetland communities are protected from type conversion, degradation, or outright loss.

Northern Lake Michigan Coastal

Examples of this community type can be found at the Green Bay West Shores State Wildlife Area, the Lake Noquebay Wildlife Area, and at various locations on the Door Peninsula. Beaver populations should be maintained at an appropriate level in this Ecological Landscape to prevent conversion of shrub-carr communities. In the past, residential development has tended to encroach on wetlands during periods of low water. Maintenance of healthy wetland ecosystems and all of their associated communities is highly dependent on maintaining them during both high and low water. Shoreline development is an especially important land use issue here.

Southeast Glacial Plains

Examples of this community type can be found at Cedarburg Bog (Ozaukee County), Cherokee Marsh (Dane County), White River Marsh State Wildlife Area, Mullet Lake Swamp (Fond du Lac County), and at scattered locations within the Southern Unit of the Kettle Moraine State Forest. Drainage for agriculture, grazing, and conversion to reed canary grass monotypes are significant problems in this Ecological Landscape. Efforts to limit these activities would be beneficia l. This is a widespread and common type here and would appropriately be featured in regional wetland protection and habitat restoration plans.

Western Coulee and Ridges

Most occurrences of this type are associated with floodplains of the major rivers. Examples can be found at Tiffany Bottoms State Wildlife Area (Buffalo County), Upper Mississippi River Fish and Wildlife Refuge, Avoca Prairie State Natural Area (Iowa County), and along the Lower Wisconsin State Riverway.

Additional Considerations for Shrub-Carr in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management of Shrub-carr

Central Lake Michigan Coastal

Examples of this community type can be found at Duvall Swamp (Kewaunee County), Kohler-Andrae State Park (Sheboygan County), and Mud Lake (Waupaca County). Shrub-carr habitat should be maintained where it exists.

Forest Transition

Examples of this community type can be found at Ninemile Swamp (Marathon County) and along the Wisconsin River and its tributaries.

North Central Forest

Examples of this community type can be found at locations within the Chequamegan-Nicolet National Forest, and on other public lands such as the Lincoln and Ashland County Forests. Alder thicket is the more common wet shrub community in this landscape. Invasives are not a large problem at present, but should be monitored. Beaver populations should be maintained at an appropriate level in this Ecological Landscape to prevent conversion of shrub-carr communities.

Southern Lake Michigan Coastal

Shrub-carr occurs at Chiwaukee Prairie State Natural Area (Kenosha County), at Cherry Lake Sedge Meadow (Racine County), at Bong State Recreation Area, and along the Des Plaines River. It is not a featured community at any of these locations, but exists as a component of a community mosaic.

Superior Coastal Plain

Examples of this community type can be found at Bibon Swamp State Natural Area (Bayfield County) and in the Superior Municipal Forest (Douglas County). Beaver populations should be maintained at an appropriate level in this Ecological Landscape to prevent conversion of shrub-carr communities. Most of the shrub swamp acreage in this Ecological Landscape is alder thicket.

3.3.8.14 Southern Sedge Meadow

3.3.8.14.1 Community Overview

Widespread in southern Wisconsin, this open wetland community is most typically dominated by tussock sedge and Canada bluejoint grass. Common associates of relatively undisturbed sedge meadows are other sedges (e.g., *Carex diandra, C. sartwellii*), marsh bellflower, marsh wild-timothy, water horehound, panicled aster, swamp aster, blue flag, spotted Joe-Pye weed, marsh fern, and swamp milkweed. Reed canary grass may be dominant in grazed and/or ditched stands, sometimes to the exclusion of virtually all other species.

Sedge meadows are most common in glaciated landscapes, where they often border streams or drainage lakes. The southern sedge meadow community occurred with prairie, savanna, and hardwood forest communities, and many of them apparently burned periodically. In the absence of fire, shrubs and trees are able to readily encroach on the open wetlands; encroachment can be exacerbated when wetlands are drained. Many sedge meadows in southeastern Wisconsin are influenced by alkaline groundwater, and occur in complexes with emergent marsh, calcareous fen, wet prairie, wet-mesic prairie, and shrub-carr. Differentiating between these communities can be difficult, as they frequently intergrade.

3.3.8.14.2 Vertebrate Species of Greatest Conservation Need Associated with Southern Sedge Meadow

Twenty-four vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with southern sedge meadow (Table 3-207).

Table 3-207. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with southern sedge meadow communities.

Species Significantly Associated with Southern Sedge Meadow
Herptiles
Blanchard's Cricket Frog
Pickerel Frog
Queen Snake
Butler's Garter Snake
Western Ribbon Snake
Eastern Massasauga Rattlesnake
Species Moderately Associated with Southern Sedge Meadow
Birds
American Bittern
Blue-winged Teal
Northern Harrier
Greater Prairie-chicken
King Rail
Whooping Crane
Barn Owl
Short-eared Owl
Willow Flycatcher
Bobolink
Eastern Meadowlark
Herptiles
Four-toed Salamander
Wood Turtle
Blanding's Turtle
Mammals
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-207 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both southern sedge meadow and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of southern sedge meadow in each of the Ecological Landscapes (Tables 3-208 and 3-209).

- Using the analysis described above, a species was further selected if it had both a significant association with southern sedge meadow and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of southern sedge meadow. These species are shown in Figure 3-52.

Table 3-208. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with southern sedge meadow communities and their association with Ecological Landscapes that support southern sedge meadow.

Southern Sedge Meadow	Herptiles (6)*					
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Blanchard's Cricket Frog	Pickerel Frog	Queen Snake	Butler's Garter Snake	Western Ribbon Snake	Eastern Massasauga Rattlesnake
MAJOR						
Central Sand Hills						
Southeast Glacial Plains						
IMPORTANT						
Central Lake Michigan Coastal						
Central Sand Plains						
Northern Lake Michigan Coastal						
Southern Lake Michigan Coastal						
Western Coulee and Ridges						
PRESENT (MINOR)						
Forest Transition						
Southwest Savanna						
Western Prairie						

Color Key

= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-209. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with southern sedge meadow communities and their association with Ecological Landscapes that support southern sedge meadow.

Southern Sedge Meadow	Birds (11)*											Herptiles (3)			Mammals (4)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	American Bittern	Blue-winged Teal	Northern Harrier	Greater Prairie-Chicken	King Rail	Whooping Crane	Barn Owl	Short-eared Owl	Willow Flycatcher	Bobolink	Eastern Meadowlark	Four-toed Salamander	Wood Turtle	Blanding's Turtle	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
MAJOR																		
Central Sand Hills	H	H	H			H		M	H	H	H	M		H	M	M	M	M
Southeast Glacial Plains	H	H	H		H	H		H	H	H	H	H		H	M	M	M	M
IMPORTANT																		
Central Lake Michigan Coastal	M	H	H		M			M	H	H	H	H	M	M	M	M	M	M
Central Sand Plains	H	H	H	H	M	H		H	H	H	H	H	H	H	M	M	M	M
Northern Lake Michigan Coastal	M	H	H						H	H	H	M	H	M	M	M	M	M
Southern Lake Michigan Coastal	M	M	M		M			M	H	H	H			H				
Western Coulee and Ridges		H	H		M	M		M	H	H	H	H	H	H	H	M	M	M
PRESENT (MINOR)																		
Forest Transition	H	H	H	H						H	H	H	H		M	M	H	M
Southwest Savanna		M	M					H	H	H	H			H	M		M	
Western Prairie	M	H	H		M			M	H	H	H		H	H				

Color Key

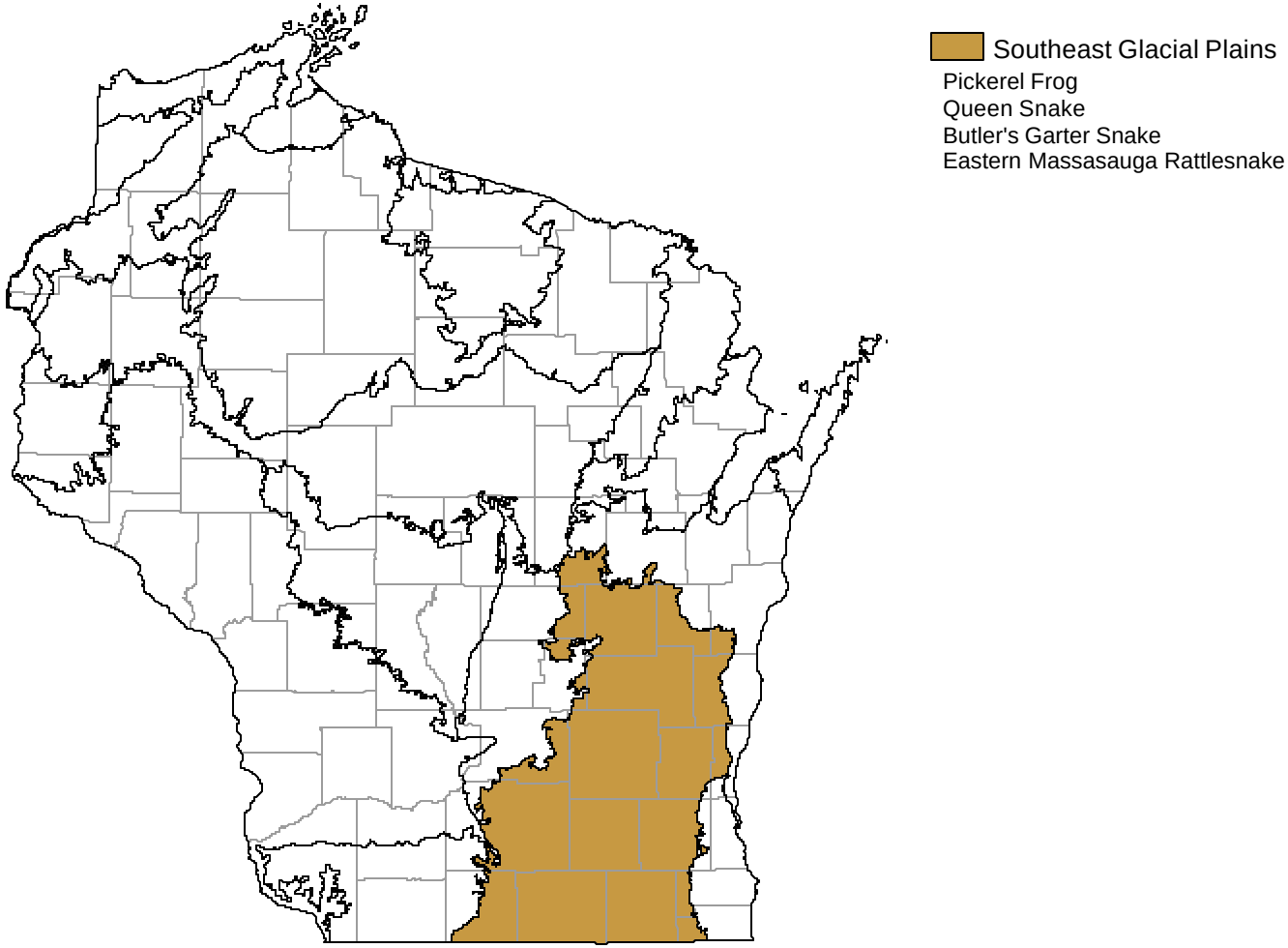
H = HIGH probability the species occurs in this Ecological Landscape

M = MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-52. Vertebrate Species of Greatest Conservation Need that have *both* a significant association with southern sedge meadow *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of southern sedge meadow.



3.3.8.14.3 Threats and Priority Conservation Actions for Southern Sedge Meadow

3.3.8.14.3.1 Statewide Overview of Threats and Priority Conservation Actions for Southern Sedge Meadow

The following list of threats and priority conservation actions were identified for southern sedge meadow in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.14.3.2 unless otherwise indicated.

Threats and Issues

- Changing hydrology by flooding or lowering water levels can be detrimental.
- Ditched stands can convert quickly to shrub-carr.
- Conversion of sedge meadow to open marsh habitat can eliminate this community type.
- Woody invasion is a problem associated with hydrologic disturbance and lack of fire.
- Major invasive species problems exist, especially with reed canary grass, purple loosestrife, and glossy buckthorn.
- Disturbance can introduce invasives that out-compete native vegetation. Excessive grazing can lower species diversity, eliminate sensitive species, facilitate the introduction of invasives, raise nutrient levels, and compact soil.

Priority Conservation Actions

- Fluctuating water levels and/or prescribed fire are needed to maintain this community.
- Avoid excessive grazing in this type because this disturbance often results in conversion to reed canary grass.
- Maintain large blocks of habitat. Manage complexes of sedge meadow in conjunction with wet prairie, savanna, surrogate prairie grasslands, and other open habitats where possible.
- Maintain open aspect by using prescribed fire where appropriate to prevent woody invasion. Follow existing management guidelines for prescribed fire to minimize impacts on sensitive species.
- Maintain hydrologic processes by preventing drainage for agriculture and flooding for open marsh habitat.
- Manage watersheds to control runoff from surrounding agricultural areas that may contribute nutrients and sediment; benefiting invasive species (e.g., reed canary grass).
- Buffer uplands and manage shorelines to prevent erosion and sedimentation and limit pollutant inputs.
- Restore hydrology in ditched areas.
- Maintain or restore natural hydrologic cycles of fluctuating water levels. Conduct additional studies to determine appropriate cycles, and the timing of high and low water.
- Control the spread of invasives and reduce or eliminate them where possible.
- Avoid disturbances (e.g., pothole creation, or the digging of level ditches) that expose mineral or organic soils by creating spoil banks, to limit establishment of invasives.
- Continue and support research to find biocontrols for problematic invasives.
- Monitor sites to determine whether management is maintaining native diversity.
- Portions of east-central Wisconsin should be more thoroughly surveyed for this community.

3.3.8.14.3.2 Additional Considerations for Southern Sedge Meadow by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of southern sedge meadow exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for southern sedge meadow found in Section 3.3.8.14.3.1.

Additional Considerations for Southern Sedge Meadow in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

Central Sand Hills

Examples of this type in this Ecological Landscape are found at French Creek State Wildlife Area (Columbia County), Fox River Crane Marsh (Marquette County), and Grand River Marsh State Wildlife Area (Green Lake County).

Southeast Glacial Plains

Examples of this type are found at Scuppernong Marsh, at several additional locations within the Southern Unit of the Kettle Moraine State Forest, at the Upper Mukwonago River Wetlands (Walworth County), White River Marsh State Wildlife Area (Green Lake County), Rush Lake Meadows (Winnebago County), and South Waubesa Wetlands State Natural Area (Dane County).

Additional Considerations for Southern Sedge Meadow in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

Northern Lake Michigan Coastal

Southern sedge meadow occurs at Peshtigo Harbor State Wildlife Area (Marinette County) and Green Bay West Shores State Wildlife Area (Oconto and Brown counties).

Central Lake Michigan Coastal

Examples of this type are found at Point Beach State Forest (Manitowoc County) and Green Bay Shores State Wildlife Area (Brown County).

Central Sand Plains

Examples of this type are found at Quincy Bluff and Wetlands State Natural Area (Adams County), Meadow Valley Wildlife Area (Juneau County), and several locations on public lands elsewhere in this Ecological Landscape. The more acidic northern sedge meadow and poor fen communities are the most common open wetland types in this landscape.

Southern Lake Michigan Coastal

Small patches of southern sedge meadow are associated with more extensive wetland communities of other types at Big Muskego Lake (Waukesha County), Chiwaukee Prairie (Kenosha County), and Mission Hills Wetlands (Milwaukee County).

Western Coulee and Ridges

Examples of this type are found at Tiffany Bottoms State Wildlife Area (Buffalo County), Avoca Prairie State Natural Area (Iowa County), and at several locations within the Lower Wisconsin State Riverway.

3.3.8.15 Submergent Aquatic

3.3.8.15.1 Community Overview

This herbaceous community of aquatic macrophytes occurs in lakes, ponds, and rivers. Submergent macrophytes often occur in deeper water than beds of floating-leaved or emergent species, but there is considerable overlap. This community type can also be found in deep water wetlands and flowages that have little moving water present. Water depth, water chemistry, water movement, and type of bottom material are among the key ecological factors that determine the nature of the submergent beds. The chemical nature of the water can greatly affect the types and abundance of aquatic plants present. Common or characteristic species and genera include various species of pondweeds, waterweed, coontail, slender naiad, eel-grass, and several species of water-milfoil and bladderwort.

Aquatic plants, including both emergent and submergent aquatic vegetation, form the foundation of healthy and flourishing aquatic ecosystems - both within lakes and rivers and on the shores and wetlands around them. They not only protect water quality, but they also produce life-giving oxygen. Aquatic plants are a lake's own filtering system, helping to clarify the water by absorbing nutrients like phosphorus and nitrogen that could stimulate algal blooms. Plant beds stabilize soft lake and river bottoms and reduce shoreline erosion by reducing the effect of waves and current.

Aquatic plants serve as spawning habitat for fish and amphibians, as shelter for various life stages of a variety of species, and as nesting habitat for birds. Plant beds support populations of aquatic insects that serve as a food base for other species. Healthy native aquatic plant communities also help prevent the establishment of invasive exotic plants like Eurasian watermilfoil.

3.3.8.15.2 Vertebrate Species of Greatest Conservation Need Associated with Submergent Aquatic

Twenty-seven vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with submergent aquatic (Table 3-210).

Table 3-210. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with submergent aquatic communities.

Species Significantly Associated with Submergent Aquatic
Birds
Trumpeter Swan
Canvasback
Redhead
Lesser Scaup
Whooping Crane
Herptiles
Blanchard's Cricket Frog
Pickerel Frog
Mink Frog
Wood Turtle
Blanding's Turtle
Queen Snake
Mammals
Moose
Species Moderately Associated with Submergent Aquatic
Birds
Red-necked Grebe
Great Egret
Snowy Egret
Yellow-crowned Night Heron
American Black Duck
Blue-winged Teal
Bald Eagle
Wilson's Phalarope
Forster's Tern
Black Tern
Herptiles
Western Ribbon Snake
Mammals
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-210 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both submergent aquatic and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of submergent aquatic in each of the Ecological Landscapes (Tables 3-211 and 3-212).

- Using the analysis described above, a species was further selected if it had both a significant association with submergent aquatic and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of submergent aquatic. These species are shown in Figure 3-53.

Table 3-211. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with submergent aquatic communities and their association with Ecological Landscapes that support submergent aquatic.

Submergent Aquatic	Birds (5)*					Herptiles (6)						Mammals (1)
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Trumpeter Swan	Canvasback	Redhead	Lesser Scaup	Whooping Crane	Blanchard's Cricket Frog	Pickerel Frog	Mink Frog	Wood Turtle	Blanding's Turtle	Queen Snake	Moose
MAJOR												
North Central Forest	H	M		H			M	H	H			M
Northern Highland		M		H				H	H			M
Northwest Sands	H	M		H			M	M	H	H		
Superior Coastal Plain	H	M		H			M	H	H			M
Western Coulee and Ridges		H		H	M	H	H		H	H		
IMPORTANT												
Central Lake Michigan Coastal		M		H			M		M	M		
Central Sand Hills					H		M			H		
Central Sand Plains	H	M		H	H		M		H	H		
Forest Transition	H	M		H			M		H			
Northeast Sands							M	H	H	M		
Northern Lake Michigan Coastal		H		H			M	H	H	M		
Northwest Lowlands							M	H	H			M
Southeast Glacial Plains		H	H	H	H		H			H	H	
Western Prairie	H	M		M			M		H	H		
PRESENT (MINOR)												
Southern Lake Michigan Coastal				H						H	M	
Southwest Savanna						H	H			H		

Color Key

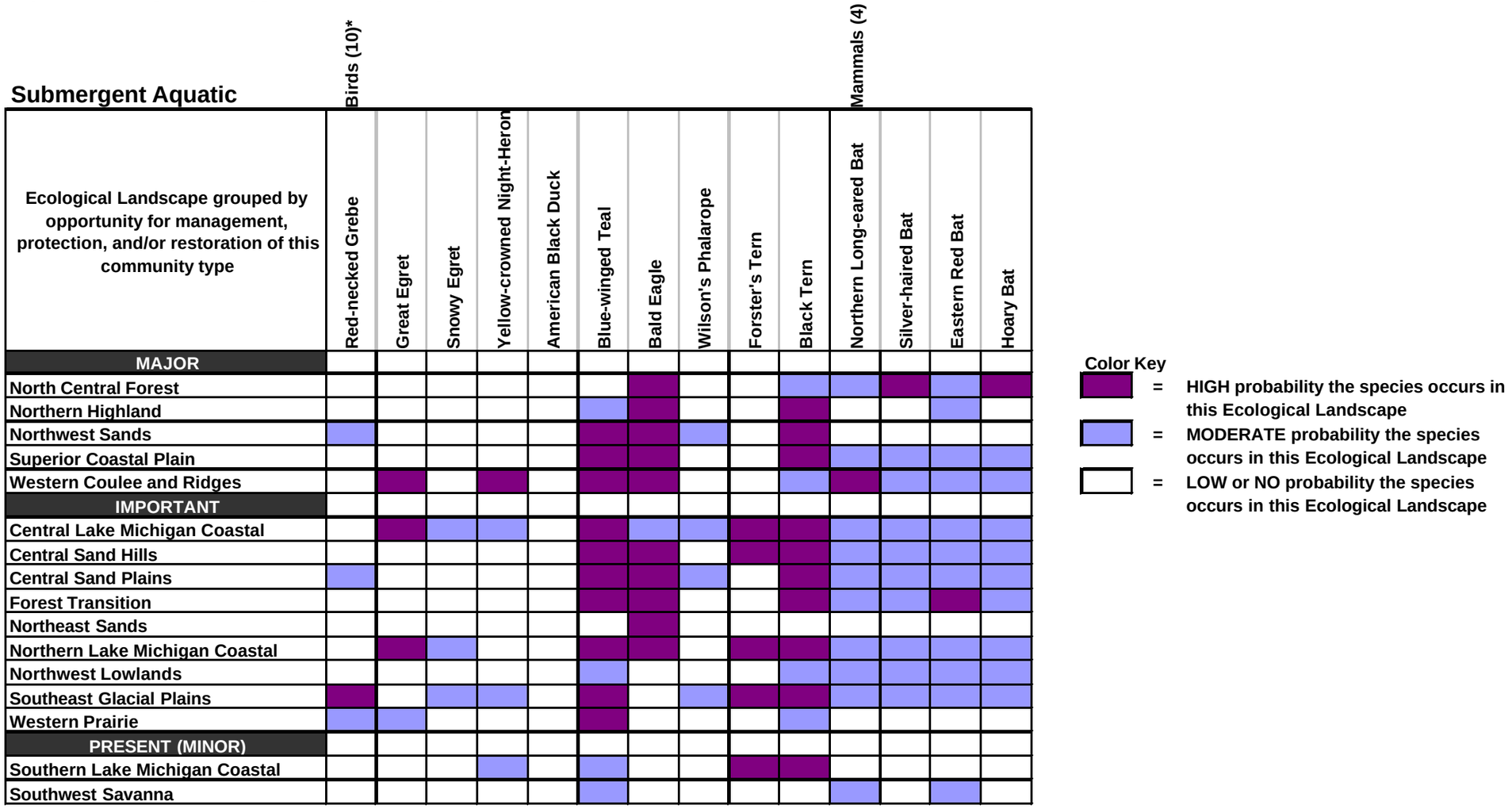
H = HIGH probability the species occurs in this Ecological Landscape

M = MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Table 3-212. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with submergent aquatic communities and their association with Ecological Landscapes that support submergent aquatic.

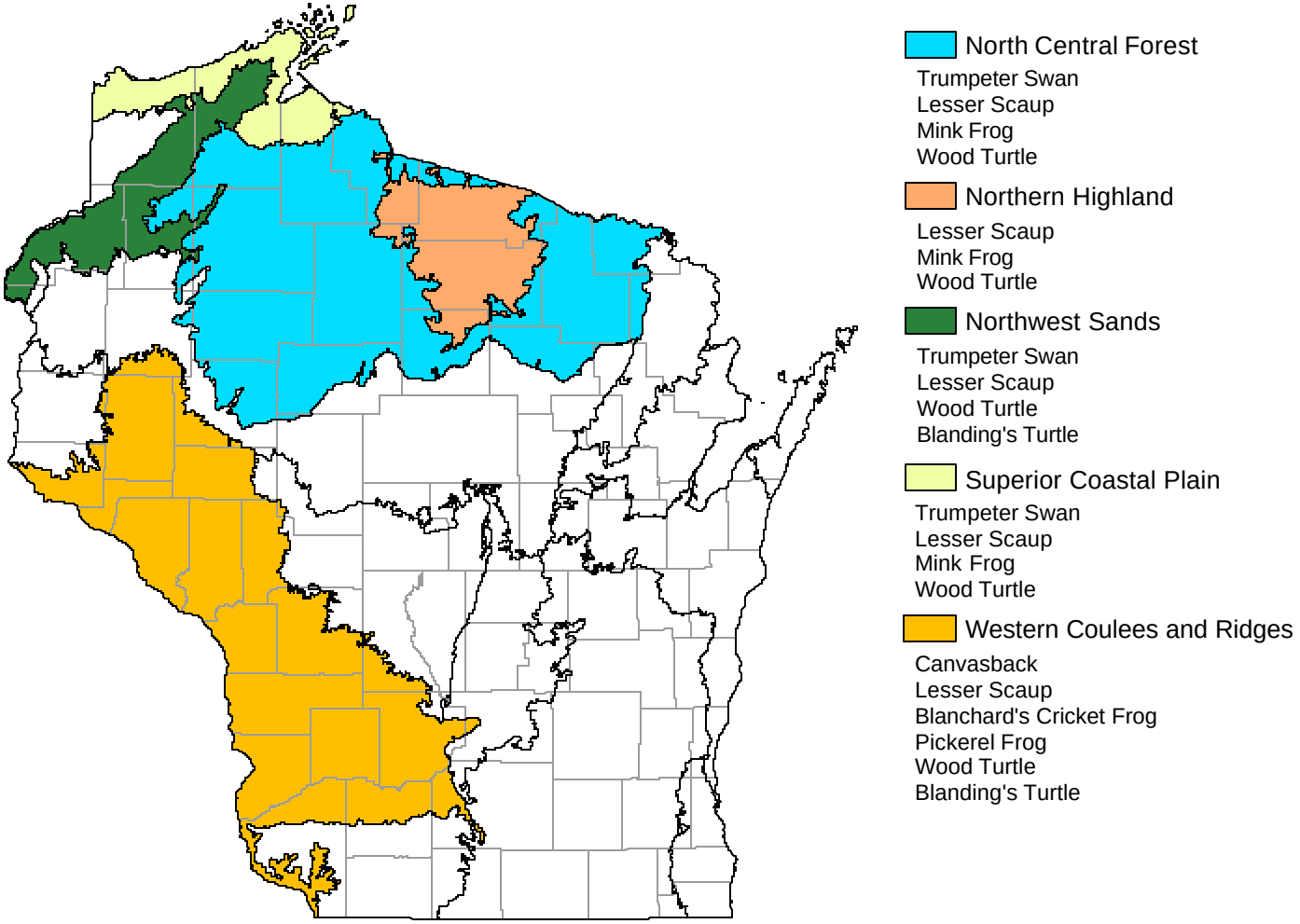


Submergent Aquatic	Birds (10)*										Mammals (4)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Red-necked Grebe	Great Egret	Snowy Egret	Yellow-crowned Night-Heron	American Black Duck	Blue-winged Teal	Bald Eagle	Wilson's Phalarope	Forster's Tern	Black Tern	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
MAJOR														
North Central Forest							H			M	M	H	M	H
Northern Highland						M	H			H			M	
Northwest Sands	M					H	H	M		H				
Superior Coastal Plain						H	H			H	M	M	M	M
Western Coulee and Ridges		H		H		H	H			M	H	M	M	M
IMPORTANT														
Central Lake Michigan Coastal		H	M	M		H	M	M	H	H	M	M	M	M
Central Sand Hills						H	H		H	H	M	M	M	M
Central Sand Plains	M					H	H	M		H	M	M	M	M
Forest Transition						H	H			H	M	M	H	M
Northeast Sands							H							
Northern Lake Michigan Coastal		H	M			H	H		H	H	M	M	M	M
Northwest Lowlands						M				M	M	M	M	M
Southeast Glacial Plains	H		M	M		H		M	H	H	M	M	M	M
Western Prairie	M	M				H				M				
PRESENT (MINOR)														
Southern Lake Michigan Coastal				M		M			H	H				
Southwest Savanna						M					M		M	

Color Key
H = HIGH probability the species occurs in this Ecological Landscape
M = MODERATE probability the species occurs in this Ecological Landscape
= LOW or NO probability the species occurs in this Ecological Landscape

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Figure 3-53. Vertebrate Species of Greatest Conservation Needthat have *both* a significant association with submergent aquatic *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of submergent aquatic.



3.3.8.15.3 Threats and Priority Conservation Actions for Submergent Aquatic

3.3.8.15.3.1 Statewide Overview of Threats and Priority Conservation Actions for Submergent Aquatic

The following list of threats and priority conservation actions were identified for submergent aquatic in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.15.3.2 unless otherwise indicated.

Threats and Issues

- Disturbance of bottom sediments from recreational powerboats can cause turbidity and physically damage the aquatic beds.
- Shoreline development can alter macrophyte habitat, introduce pollutants, and increase erosion. Sedimentation, eutrophication, and pollution of water can cause detrimental changes to community composition, structure, and function.
- Mercury and acidification are serious issues in some northern Ecological Landscapes.
- Weed removal and use of pesticides damages habitat and may encourage invasives. Invasive plants can replace native plants and dominate aquatic communities.
- The prevalence of carp in the waterbodies of several Ecological Landscapes contributes to destruction and degradation of aquatic vegetation and aquatic habitats.
- Rusty crayfish aggressively displace native crayfish and have drastically reduced the abundance, structure, and diversity of native submergent aquatic plant populations in some lakes.
- The placement of shoreline structures such as piers, boat lifts, and ramps can reduce the amount of nearshore submergent aquatic habitats that are beneficial to fish, invertebrates, and many wildlife species.
- Dam management and other water-level manipulation activities can affect the amount and composition of this community type.

Priority Conservation Actions

- Protect aquatic vegetation by working with conservation managers and private interest groups. Lake associations, lake management districts and Land Conservation Departments play a key role in supporting education regarding this community and protection of this community type.
- Attach Sensitive Area Designation to sites that meet the criteria of that designation, as one means to protect emergent plant communities from the potential degradation caused by human activity.
- Work with lake management districts, lake associations, and the WDNR exotics team to identify priority research needs and develop strategies to minimize invasive species impacts that are present within or likely to affect a particular Ecological Landscape's waterbodies.
- Where feasible, this community type should be managed as part of a complex of other upland and wetland vegetation types.
- Restore wild rice, a submergent aquatic in its early life stages, where appropriate.
- Create no-wake zones where needed if possible.
- Buffer uplands and manage shorelines to prevent erosion and sedimentation, and limit pollutant inputs.
- Encourage local communities to accept Smart Growth plans by demonstrating benefits.
- Restore shorelines where possible.
- Maintain natural hydrologic processes. Manage dams and impoundments to protect sensitive species (e.g., wintering amphibians or reptiles). Avoid artificially prolonged stable water levels that will reduce the diversity of the community over time.
- Study hydrologic cycles and gather information on water quality and fluctuations that are beneficial to this community type.

- Continue and support research to find biocontrols for invasives; control spread of new invasives.

3.3.8.15.3.2 Additional Considerations for Submergent Aquatic by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of submergent aquatic communities exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for submergent aquatic found in Section 3.3.8.15.3.1.

Additional Considerations for Submergent Aquatic in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

North Central Forest

This community type is present in the deeper, quiet bays of many lakes, in some of the region's low gradient streams, and also in impoundments, such as the Gile Flowage (Iron County), the Chippewa Flowage (Sawyer County) and the Mondeaux Flowage (Taylor County). Invasives such as Eurasian water-milfoil and curly pondweed are problems in parts of this Ecological Landscape.

Northern Highland

This community type is present in many lakes and low gradient streams, as well as in impoundments such as Thunder Marsh (Oneida County), Turtle-Flambeau Flowage (Iron County), Rainbow Flowage and nearby stretches of the Upper Wisconsin River (Oneida County), and Willow Flowage (Oneida County). Development pressures are very high in this Ecological Landscape and there is a need to protect undeveloped shorelines in the near future. Rusty crayfish have significantly impacted lakes in this Ecological Landscape.

Northwest Sands

This community type is present in quiet bays of many lakes in this Ecological Landscape, along certain stretches of low gradient streams, and in impoundments such as Gordon Flowage (Douglas County), Phantom Flowage on Crex Meadows State Wildlife Area (Burnett County), Amsterdam Sloughs State Wildlife Area (Burnett County), and the Clam River Flowage (Burnett County). Development pressures on shorelines are very high here and there is a need to protect more undeveloped lakes.

Superior Coastal Plain

Submergent aquatic communities are primarily associated with coastal embayments and estuaries on Lake Superior. Inland lakes are scarce in this Ecological Landscape. Additional considerations for submergent aquatic communities in the Superior Coastal Plain Ecological Landscape are listed below.

- Disturbance from recreational powerboats coming into the larger rivers from Lake Superior can suspend sediments and physically damage beds of aquatic plants.
- Use of herbicides can damage habitat.
- Eutrophication (e.g., in the St. Louis River estuary (Douglas County), Port Wing (Bayfield County), or in the Fish Creek Sloughs (Ashland County)) can cause detrimental changes to community composition and structure.
- Invasive plants such as curly pondweed, purple loosestrife, and giant reed have replaced sensitive natives. Problematic invasive animals include spiny water flea, round goby, ruffe, and white perch.

- Soil erosion and sedimentation from uplands into water bodies is a particular threat in this Ecological Landscape due to the erodible soils, agricultural activities, and impermeable surfaces.
- The lack of conifers in the forests of the region contributes to increased peakflow episodes during spring snowmelt that can exacerbate erosion.
- Unsustainable forest management and other land use practices can result in soil erosion and diminished water quality. Use Best Management Practices and other sustainable forest management practices to limit activities detrimental to soil and water.
- Protect more of this community type by working with conservation managers and interest groups.
- Restore wild rice where possible; protect and maintain rice beds in the Kakagon Sloughs.
- Reforest uplands within the watershed, restoring conifers where appropriate.
- Use adaptive management techniques to restore structure and composition to damaged streams and degraded wetlands.
- Gather more information on land use in the watershed and research its effects on peakflows.

Western Coulee and Ridges

The Mississippi River corridor, including its associated marshes and floodplain, is of continental importance to migratory waterfowl. The series of dams constructed on the Mississippi in the early part of the Twentieth Century severely disrupted the natural periodicity and magnitude of floods. While marsh habitat has been created in some areas, much of the sediment load that was formerly carried downstream is now deposited in the backwaters, filling them in and shortening the natural life of the aquatic beds. The submergent marsh community is now well-developed in some backwaters of the large rivers (e.g., Mississippi, Wisconsin, Chippewa, and Black Rivers). It provides an important fish nursery. Significant examples due to their size and importance to migratory waterfowl, other birds, turtles, and fish exist at several locations on the Mississippi River. Restoration efforts are taking place in areas such as Lake Onalaska, which is being replanted with wild celery. Wild celery is a favorite food plant of the canvasback duck, which stops here in vast numbers along with many other waterfowl species during migration periods. Good examples of marshes dominated by American lotus occur at Trempealeau National Wildlife Refuge (Trempealeau County) and Bertom Lake (Grant County).

Additional considerations for submergent aquatic communities in the Western Coulees and Ridges Ecological Landscape are listed below.

- Manage submergent marsh as part of a complex, with other marsh and wet meadow communities, floodplain forest, shrub-carr, and adjoining uplands.
- Development on ridges above rivers can alter shoreline habitat and increase erosion. Rip-rapping, levees, seawalls, and dikes have been constructed and have impacted habitat (in some locations these have had some positive effects by protecting marshes from sedimentation and pollutants behind dikes).
- Use of pesticides can damage habitat and encourage invasives.
- Agricultural practices can result in soil erosion and water quality problems.
- Sedimentation is damaging wild celery beds and detrimentally impacting migratory waterfowl.
- Invasive plants, such as curly pondweed, can replace native plants and degrade aquatic communities. Invasive animals (e.g., zebra mussels and carp) are also a significant problem in this Ecological Landscape.
- Barge traffic on the Mississippi River requires dredging and subsequent disposal of dredge spoils, which stirs up bottom sediments. Wave action from barges and other boat traffic can damage aquatic beds.
- Past filling for roads, railroads, and industrial sites has affected this community. Competing economic interests limit opportunities for this type in the Ecological Landscape.

Additional Considerations for Submergent Aquatic in Ecological Landscapes with ***Important*** Opportunities for Protection, Restoration, and/or Management

Central Lake Michigan Coastal

This Ecological Landscape is heavily developed for agricultural, industrial, and residential purposes. There are continuing effects from past management decisions (e.g., filling of marshes, loss of wild rice). Sedimentation, weed removal, and the use of pesticides can damage marsh habitat and encourage the growth and spread of invasives.

Central Sand Hills

Runoff from agricultural activities adjacent to streambanks and stormwater from urban areas tops the list of non-point source pollution sources in the Central Sand Hills. These sources of pollutants degrade or otherwise threaten many streams, lakes, wetlands and/or groundwater. Additional considerations for submergent aquatic communities in the Central Sand Hills Ecological Landscape are listed below.

- Assist farmers with nutrient and pesticide management planning to help control non-point discharges within the watershed.
- Encourage riparian residents and others to participate in self-help volunteer lake monitoring programs.
- Lakeshore and other waterway developments continue to threaten nearshore terrestrial and aquatic habitat that is critical to species diversity. Through lake associations, lake districts, and others promote a strong riparian owner education effort to help illustrate the importance of proper land and shoreline management.
- Exotic invasive species such as purple loosestrife, zebra mussel, Eurasian water-milfoil, and curly pondweed continue to expand in this Ecological Landscape, in part due to disturbances.
- Recreational use of lakes and other waterways is extremely high here. This presents public safety and shoreline erosion concerns, and destroys aquatic vegetation. Regulation, through lake patrols or via other means, should be sought.

Central Sand Plains

The hydrology throughout much of the Central Sand Plains has been altered by a maze of dikes, drainage ditches, canals, and constructed impoundments. High acidity and low fertility makes the waters of this Ecological Landscape generally inhospitable to aquatic vegetation. Among the exceptions, though, are several plant species that are adapted to such conditions, such as Farwell's milfoil and twin-stemmed bladderwort, which are locally common in several of the impoundments in the western part of the Ecological Landscape. Most of the impoundments on public lands were originally constructed to benefit waterfowl, something they're not always well-suited for because of the chemical nature of the waters. Others were developed to provide a constant source of water for the cranberry industry, which is a major economic concern in this region.

Backwaters of the Wisconsin and Yellow Rivers contain more familiar assemblages of pondweeds, coontail, waterweed, water lilies, watershield, and common bladderwort.

Runoff from agricultural activities adjacent to streambanks and impoundments and stormwater runoff from urban areas are non-point pollution sources in the Central Sand Plains. These sources can degrade or otherwise threaten streams, impoundments, wetlands or groundwater. Assistance should be provided to farmers and cranberry growers for development of nutrient and pesticide management plans that help

control non-point discharges within the watershed. Riparian residents and others should be encouraged to participate in self-help volunteer lake monitoring programs.

Forest Transition

The more intact (i.e., forested) watersheds in this Ecological Landscape occur on the eastern and extreme northern margins. In other portions of this Ecological Landscape, agriculture is a major land use and associated practices can result in soil erosion and water quality problems. Invasive plants may replace native plants and affect the composition of aquatic communities. Submergent marsh occurs in quiet bays of some of the Ecological Landscapes lakes, and in the backwaters of larger rivers such as the Wisconsin and its tributaries. Impoundments are common in the Wisconsin River system, and some of them do provide suitable conditions for the development of submergent marsh.

Northeast Sands

Good examples of submergent marsh occur in lakes and stretches of low-gradient streams, especially within some of the public lands in the Ecological Landscape.

Northern Lake Michigan Coastal

The Lower Wolf River Bottomlands (Shawano & Outagamie Counties), Oconto River Marsh (Oconto County), Peshtigo Harbor Marsh (Marinette County) and Green Bay West Shore Wetlands (Oconto County) contain examples of this community. Uplands should be buffered and shorelines should be managed to prevent erosion and sedimentation, and limit input of pollutants (including through pathways associated with the underground aquifers and fractured dolomite bedrock that underlies the Door Peninsula). Disturbance of polluted sediments buried in the bottoms of Green Bay and the larger rivers should be avoided.

Northwest Lowlands

The Trade River Wetlands (Polk & Burnett Counties) are an example of this community type. Most problems are associated with the larger developed lakes, where invasive plants (e.g., purple loosestrife) have replaced natives and shoreline habitat has been developed. This type is less common in this Ecological Landscape than elsewhere. Peatlands are the major wetland community types here.

Southeast Glacial Plains

There are continuing impacts from past management decisions (e.g., draining and filling marshes and loss of wild rice). Additional considerations for submergent aquatic communities in the Southeast Glacial Plains Ecological Landscape are listed below.

- Weed removal and use of pesticides can damage habitat and encourage invasives.
- Land use planning needs to be comprehensive and emphasize conservation considerations to improve conditions for aquatic communities.
- Sedimentation and pollution from agricultural and urban areas negatively affects water quality and substrate conditions. Manage watersheds to control runoff from surrounding agricultural and urban areas that contributes pollutants, nutrients, and sediments.
- Invasive plants and animals are an extreme problem in this heavily developed landscape. Carp management can also have impacts on submergent marsh.

- Restore wild rice to appropriate locations, if possible (most aquatic systems in this Ecological Landscape are too hydrologically altered, sediment-filled, and nutrient-enriched to support wild rice at this time).

Western Prairie

This community is found in backwaters of the St. Croix River, and in some prairie pothole lakes and ponds. Past agricultural practices have detrimentally impacted this community, and soil and water quality are still being affected in negative ways. Sedimentation is damaging aquatic beds and detrimentally impacting migratory waterfowl. Additional considerations for submergent aquatic communities in the Western Prairie Ecological Landscape are listed below.

- Invasive plants and animals are problems here.
- The raising of baitfish in prairie pothole lakes and ponds is a threat to native invertebrate and herptiles populations and should be controlled. Nesting birds can also be disrupted when the baitfish are harvested.
- Protect more of this community type by working with conservation managers and private interest groups.
- Manage the marshes as integral components of the prairie pothole landscape, including extensive open grasslands, or as part of the St. Croix River floodplain mosaic.

3.3.8.16 Submergent Aquatic-Oligotrophic Marsh

3.3.8.16.1 Community Overview

This herbaceous community of aquatic macrophytes is a variant of the submergent aquatic community. It represents a distinctive assemblage of highly specialized submersed, rosette-forming aquatic macrophytes that occur in northern Wisconsin in clear, deep, circumneutral lakes with extremely soft water. Bottom materials are usually sand, or occasionally gravel, and there is often an abrupt transition from submergent marsh to a forested upland shore. The aquatic plants grow at depths that range from the shallows at the beach line, to several meters. Characteristic species include American shore-grass, pipewort, yellow hedge-hyssop, aquatic lobelia, a milfoil (*Myriophyllum tenellum*), brown-fruit rush, and quillworts.

3.3.8.16.2 Vertebrate Species of Greatest Conservation Need Associated with Submergent Aquatic-Oligotrophic marsh

Seven vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with submergent aquatic-oligotrophic marsh (Table 3-213).

Table 3-213. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with submergent aquatic-oligotrophic marsh communities.

Species Significantly Associated with Submergent Aquatic-Oligotrophic Marsh
Herptiles
Blanding's Turtle
Mammals
Moose
Species Moderately Associated with Submergent Aquatic-Oligotrophic Marsh
Herptiles
Mink Frog
Mammals
Northern Long-Eared Bat
Silver-Haired Bat
Eastern Red Bat
Hoary Bat

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-213 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both submergent aquatic-oligotrophic marsh and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of submergent aquatic-oligotrophic marsh in each of the Ecological Landscapes (Tables 3-214 and 3-215).

Table 3-214. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with submergent aquatic-oligotrophic marsh communities and their association with Ecological Landscapes that support submergent aquatic-oligotrophic marsh.

Submergent Aquatic - Obligotrophic Marsh	Herptiles (1)*	Mammals (1)
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Blanding's Turtle	Moose
MAJOR		
Northern Highland		
PRESENT (MINOR)		
Northwest Sands		

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

Color Key

= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

Table 3-215. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with submergent aquatic-oligotrophic marsh communities and their association with Ecological Landscapes that support submergent aquatic-oligotrophic marsh.

Submergent Aquatic Oligotrophic Marsh	Herptiles (1)*	Mammals (4)			
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Mink Frog	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
MAJOR					
Northern Highland					
PRESENT (MINOR)					
Northwest Sands					

Color Key

= **HIGH probability the species occurs in this Ecological Landscape**

= **MODERATE probability the species occurs in this Ecological Landscape**

= **LOW or NO probability the species occurs in this Ecological Landscape**

*** The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.**

3.3.8.16.3 Threats and Priority Conservation Actions for Submergent Aquatic-Oligotrophic Marsh

3.3.8.16.3.1 Statewide Overview of Threats and Priority Conservation Actions for Submergent Aquatic-Oligotrophic Marsh

The following list of threats and priority conservation actions were identified for submergent aquatic-oligotrophic marsh in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.8.16.3.2 unless otherwise indicated.

Threats and Issues

- Disturbance of bottom sediments from recreational powerboats can cause turbidity and physically damage the aquatic beds.
- Shoreline development can alter macrophyte habitat, introduce pollutants, and increase erosion. Sedimentation, eutrophication, and pollution of water can cause detrimental changes to community composition, structure, and function.
- Mercury and acidification are serious issues in some northern Ecological Landscapes.
- Weed removal and use of pesticides damages habitat and may encourage invasives. Invasive plants can replace native plants and dominate aquatic communities.
- The prevalence of carp in the waterbodies of several Ecological Landscapes contributes to destruction and degradation of aquatic vegetation and aquatic habitats.
- The placement of shoreline structures such as piers, boat lifts, and ramps can reduce the amount of nearshore submergent aquatic habitats that are beneficial to fish, invertebrates, and many wildlife species.
- Dam management and other water-level manipulation activities can affect the amount and composition of this community type.

Priority Conservation Actions

- Protect aquatic vegetation by working with conservation managers and private interest groups. Lake associations, lake management districts and Land Conservation Departments play a key role in supporting education regarding this community and protection of this community type.
- Work with lake management districts, lake associations, and the WDNR exotics team to identify priority research needs and develop strategies to minimize invasive species impacts that are present within or likely to affect a particular Ecological Landscape's waterbodies.
- Where feasible, this community type should be managed as part of a complex of other upland and wetland vegetation types.
- Restore wild rice, a submergent aquatic in its early life stages, where appropriate.
- Create no-wake zones where needed if possible.
- Buffer uplands and manage shorelines to prevent erosion and sedimentation, and limit pollutant inputs.
- Encourage local communities to accept Smart Growth plans by demonstrating benefits.
- Restore shorelines where possible.
- Maintain natural hydrologic processes. Manage dams and impoundments to protect sensitive species (e.g., wintering amphibians or reptiles). Avoid artificially prolonged stable water levels that will reduce the diversity of the community over time.
- Study hydrologic cycles and gather information on water quality and fluctuations that are beneficial to this community type.
- Continue and support research to find biocontrols for invasives; control spread of new invasives.

3.3.8.16.3.2 Additional Considerations for Submergent Aquatic-Oligotrophic Marsh by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of submergent aquatic-oligotrophic marsh exist. Those considerations are described below and are in addition to the statewide threats and priority conservation actions for submergent aquatic-oligotrophic marsh found in Section 3.3.8.16.3.1.

Additional Considerations for Submergent Aquatic-Oligotrophic Marsh in Ecological Landscapes with ***Major*** Opportunities for Protection, Restoration, and/or Management

Northern Highland

This Ecological Landscape contains numerous lakes that have the appropriate water chemistry, bottom types, and shoreline characteristics to support the *oligotrophic marsh* type. Composition consists of unusual assemblages of macrophytes, which exist as dense carpets of sterile rosettes on the lake bottom. Lakes of this type are poorly buffered by carbonate materials and are highly vulnerable to negative impacts such as acidification from air pollution. Development pressures are very high in this Ecological Landscape and there is a need to protect undeveloped shorelines in the near future.